
darc

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DARKWEB CRAWLER PROJECT

`darc` is designed as a swiss-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.

1.1 Main Processing

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

`darc.process._dump_last_word(errors=True)`
Dump data in queue.

Parameters `errors` (*bool*) – If the function is called upon error raised.

The function will remove the backup of the `requests` database `_queue_requests.txt.tmp` (if exists) and the backup of the `selenium` database `_queue_selenium.txt.tmp` (if exists).

If `errors` is `True`, the function will copy the backup of the `requests` database `_queue_requests.txt.tmp` (if exists) and the backup of the `selenium` database `_queue_selenium.txt.tmp` (if exists) to the corresponding database.

The function will also remove the PID file `darc.pid`

See also:

- `darc.const.getpid()`
- `darc.db.save_requests()`
- `darc.db.save_selenium()`

`darc.process._get_requests_links()`
Fetch links from queue.

Returns List of links from the `requests` database.

Return type `List[str]`

Deprecated since version 0.1.0: Use `darc.db.load_requests()` instead.

`darc.process._get_selenium_links()`
Fetch links from queue.

Returns List of links from the `selenium` database.

Return type `List[str]`

Deprecated since version 0.1.0: Use `darc.db.load_selenium()` instead.

`darc.process._load_last_word()`

Load data to queue.

The function will copy the backup of the `requests` database `_queue_requests.txt.tmp` (if exists) and the backup of the `selenium` database `_queue_selenium.txt.tmp` (if exists) to the corresponding database.

The function will also save the process ID to the `darc.pid` PID file.

See also:

- `darc.const.getpid()`
- `darc.db.load_requests()`
- `darc.db.load_selenium()`

`darc.process._signal_handler(signum=None, frame=None)`

Signal handler.

The function will call `_dump_last_word()` to keep a decent death.

If the current process is not the main process, the function shall do nothing.

Parameters

- **signum** (`Union[int, signal.Signals, None]`) – The signal to handle.
- **frame** (`types.FrameType`) – The traceback frame from the signal.

See also:

- `darc.const.getpid()`

`darc.process.process()`

Main process.

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

The general process can be described as following:

0. `process()`: obtain URLs from the `requests` link database (c.f. `load_requests()`), and feed such URLs to `crawler()` with *multiprocessing* support.
1. `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`), `darc` will save the document using `save_html()` or `save_file()` accordingly. And if the submission API is provided, `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()`).

2. `process()`: after the obtained URLs have all been crawled, `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` is `True`, the function will be called with `multithreading` support; if none, the function will be called in single-threading.

3. `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 `selenium.webdriver.Chrome` object.

If successful, the rendered source HTML document will be saved using `save_html()`, 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()`).

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.

1.2 Web Crawlers

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

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

`darc.crawl.crawler(url)`

Single `requests` crawler for a entry link.

Parameters `url (str)` – URL to be crawled by `requests`.

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

See also:

- `darc.proxy.null.fetch_sitemap()`

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`), darc will save the document using `save_html()` or `save_file()` accordingly. And if the submission API is provided, `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(url)`

Single `selenium` loader for a entry link.

Parameters `url` (`str`) – URL to be crawled by `requests`.

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` object.

If successful, the rendered source HTML document will be saved using `save_html()`, and a full-page screenshot will be taken and saved.

See also:

- `darc.const.SE_EMPTY`
- `darc.const.SE_WAIT`

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()`).

1.3 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`.

class `darc.link.Link` (*url*, *proxy*, *url_parse*, *host*, *base*, *name*)

Bases: `object`

Parsed link.

Parameters

- **url** (*str*) – original link
- **proxy** (*str*) – proxy type
- **host** (*str*) – URL's hostname
- **base** (*str*) – base folder for saving files
- **name** (*str*) – hashed link for saving files
- **url_parse** (`urllib.parse.ParseResult`) – parsed URL from `urllib.parse.urlparse()`

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.

base: `str = None`

base folder for saving files

host: `str = None`

URL's hostname

name: `str = None`

hashed link for saving files

proxy: `str = None`

proxy type

url: `str = None`

original link

url_parse: `urllib.parse.ParseResult = None`

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

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

Parse link.

Parameters

- **link** (*str*) – link to be parsed
- **host** (*Optional[str]*) – hostname of the link

Returns The parsed link object.

Return type *darc.link.Link*

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 *host-name*) 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 *ed2k*, then the link is an ED2K magnet link, set *proxy* as *ed2k*.
5. If the scheme is *magnet*, then the link is a magnet link, set *proxy* as *magnet*.
6. If the scheme is *mailto*, then the link is an email address, set *proxy* as *mail*.
7. If the scheme is *irc*, then the link is an IRC link, set *proxy* as *irc*.
8. If the scheme is **NOT** any of *http* or *https*, then set *proxy* to the scheme.
9. If the *host* is *None*, set *hostname* to *(null)*, set *proxy* to *null*.
10. If the *host* is an onion (*.onion*) address, set *proxy* to *tor*.
11. If the *host* is an I2P (*.i2p*) address, or any of *localhost:7657* and *localhost:7658*, set *proxy* to *i2p*.
12. 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`.

13. 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`.

14. 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** (*AnyStr*) – string to be quoted
- **safe** (*AnyStr*) – characters not to escape
- **encoding** (*Optional[str]*) – string encoding
- **errors** (*Optional[str]*) – encoding error handler

Returns The quoted string.

Return type `str`

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

Returns The quoted string.

Return type `str`

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

Returns The joined URL.

Return type `str`

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

Returns The parse result.

Return type `urllib.parse.ParseResult`

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.

1.4 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[str]*) – List of links to be checked.

Returns List of links matches the requirements.

Return type *List[str]*

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[str]*) – List of links to be checked.

Returns List of links matches the requirements.

Return type *List[str]*

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` (`darc.link.Link`) – The link object to be checked.

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

Return type `bool`

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` (`str`) – 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`.

Returns An iterator of extracted links.

Return type `Iterator[str]`

See also:

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

`darc.parse.get_content_type(response)`

Get content type from `response`.

Parameters `response` (`requests.Response`.) – Response object.

Returns The content type from `response`.

Return type `str`

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

`darc.parse.get_sitemap(link, text, host=None)`

Fetch link to other sitemaps from a sitemap.

Parameters

- `link` (`str`) – 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`.

Returns List of link to sitemaps.

Return type `List[darc.link.Link]`

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

`darc.parse.match_host(host)`

Check if hostname in black list.

Parameters `host` (*str*) – Hostname to be checked.

Returns If `host` in black list.

Return type `bool`

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

See also:

- `darc.const.LINK_WHITE_LIST`
- `darc.const.LINK_BLACK_LIST`

`darc.parse.match_mime(mime)`

Check if content type in black list.

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

Returns If `mime` in black list.

Return type `bool`

See also:

- `darc.const.MIME_WHITE_LIST`
- `darc.const.MIME_BLACK_LIST`

`darc.parse.match_proxy(proxy)`

Check if proxy type in black list.

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

Returns If `proxy` in black list.

Return type `bool`

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

See also:

- `darc.const.PROXY_WHITE_LIST`
- `darc.const.PROXY_BLACK_LIST`

`darc.parse.read_robots(link, text, host=None)`

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

Parameters

⁰ <https://www.sitemaps.org/protocol.html#index>

- **link** (*str*) – 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.

Returns List of link to sitemaps.

Return type List[[darc.link.Link](#)]

Note: If the link to sitemap is not specified in robots.txt⁰, the fallback link /sitemap.xml will be used.

`darc.parse.read_sitemap(link, text, check=False)`

Read sitemap.

Parameters

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

Returns List of links extracted.

Return type Iterator[str]

See also:

- [darc.parse._check\(\)](#)
- [darc.parse._check_ng\(\)](#)

1.5 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
├── _queue_requests.txt
├── _queue_requests.txt.tmp
├── _queue_selenium.txt
├── _queue_selenium.txt.tmp
├── api
│   ├── <proxy>
│   │   ├── <scheme>
│   │   │   ├── <hostname>
│   │   │   │   ├── new_host
│   │   │   │   │   ├── <hash>_<timestamp>.json
│   │   │   │   │   ├── requests
│   │   │   │   │   │   ├── <hash>_<timestamp>.json
│   │   │   │   │   │   ├── selenium
│   │   │   │   │   │   │   ├── <hash>_<timestamp>.json
```

(continues on next page)

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

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`darc.save.has_folder(link)`

Check if is a new host.

Parameters `link` (`darc.link.Link`) – Link object to check if is a new host.

Returns

- If link is a new host, return `link.base`.
- If not, return `None`.

Return type `Optional[str]`

`darc.save.has_html(time, link)`

Check if we need to re-craw the link by `selenium`.

Parameters

- `link` (`darc.link.Link`) – Link object to check if we need to re-craw the link by `selenium`.
- `time` (`NewType.<locals>.new_type`) –

Returns

- If no need, return the path to the document, i.e. `<root>/<proxy>/<scheme>/<hostname>/<hash>_<timestamp>.html`.
- If needed, return `None`.

Return type `Optional[str]`

See also:

- `darc.const.TIME_CACHE`

`darc.save.has_raw(time, link)`

Check if we need to re-craw the link by `requests`.

Parameters

- **link** (`darc.link.Link`) – Link object to check if we need to re-craw the link by `requests`.
- **time** (`NewType.<locals>.new_type`) –

Returns

- If no need, return the path to the document, i.e. `<root>/<proxy>/<scheme>/<hostname>/<hash>_<timestamp>_raw.html`, or `<root>/<proxy>/<scheme>/<hostname>/<hash>_<timestamp>.dat`.
- If needed, return `None`.

Return type `Optional[str]`**See also:**

- `darc.const.TIME_CACHE`

`darc.save.has_robots(link)`Check if `robots.txt` already exists.**Parameters** **link** (`darc.link.Link`) – Link object to check if `robots.txt` already exists.**Returns**

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

Return type `Optional[str]``darc.save.has_sitemap(link)`Check if `sitemap` already exists.**Parameters** **link** (`darc.link.Link`) – Link object to check if `sitemap` already exists.**Returns**

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

Return type `Optional[str]``darc.save.sanitise(link, time=None, raw=False, data=False, headers=False, screenshot=False)`

Sanitise link to path.

Parameters

- **link** (`darc.link.Link`) – Link object to sanitise the path
- **time** (`datetime.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`.

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`.

Return type `str`

See also:

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

`darc.save.save_file(time, link, content)`

Save file.

The function will also try to make symbolic links from the saved file standard path to the relative path as in the URL.

Parameters

- **time** (`datetime.datetime`) – Timestamp of generic file.
- **link** (`darc.link.Link`) – Link object of original URL.
- **content** (`bytes`) – Content of generic file.

Returns Saved path to generic content type file, `<root>/<proxy>/<scheme>/<hostname>/<hash>_<timestamp>.dat`.

Return type `str`

See also:

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

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

Save HTTP response headers.

Parameters

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

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

Return type `str`

The JSON data saved is as following:

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

See also:

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

`darc.save.save_html` (*time*, *link*, *html*, *raw=False*)

Save response.

Parameters

- **time** (*datetime.datetime*) – Timestamp of HTML document.
- **link** (*darc.link.Link*) – Link object of original URL.
- **html** (*Union[str, bytes]*) – Content of HTML document.
- **raw** (*bool*) – If is fetched from `requests`.

Returns

Saved path to HTML document.

- If `raw` is `True`, `<root>/<proxy>/<scheme>/<hostname>/<hash>_<timestamp>_raw.html`.
- If not, `<root>/<proxy>/<scheme>/<hostname>/<hash>_<timestamp>.html`.

Return type `str`

See also:

- `darc.save.sanitise()`
- `darc.crawl.crawler()`
- `darc.crawl.loader()`

`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` (`darc.link.Link`) – Link object to be saved.

See also:

- `darc.const.PATH_LN`
- `darc.save._SAVE_LOCK`

`darc.save.save_robots(link, text)`

Save `robots.txt`.

Parameters

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

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

Return type `str`

See also:

- `darc.save.sanitise()`

`darc.save.save_sitemap(link, text)`

Save sitemap.

Parameters

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

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

Return type `str`

See also:

- `darc.save.sanitise()`

`darc.save._SAVE_LOCK: multiprocessing.Lock`
 I/O lock for saving link hash database `link.csv`.

See also:

- `darc.save.save_link()`

1.6 Link Database

The `darc` project utilises file system based database to provide tele-process communication.

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

There will be two databases, both locate at root of the data storage path `PATH_DB`:

- the `requests` database – `queue_requests.txt`
- the `selenium` database – `queue_selenium.txt`

At runtime, after reading such database, `darc` will keep a backup of the database with `.tmp` suffix to its file extension.

`darc.db.load_requests()`

Load link from the `requests` database.

After loading, `darc` will backup the original database `queue_requests.txt` as `queue_requests.txt.tmp` and empty the loaded database.

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

Return type List[str]

Note: Lines start with `#` will be considered as comments. Empty lines and comment lines will be ignored when loading.

`darc.db.load_selenium()`

Load link from the `selenium` database.

After loading, `darc` will backup the original database `queue_selenium.txt` as `queue_selenium.txt.tmp` and empty the loaded database.

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

Return type List[str]

Note: Lines start with `#` will be considered as comments. Empty lines and comment lines will be ignored when loading.

`darc.db.save_requests(entries, single=False)`

Save link to the `requests` database.

Parameters

- **entries** (*Iterable[str]*) – Links to be added to the `requests` 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.

`darc.db.save_selenium(entries, single=False)`
Save link to the `selenium` database.

Parameters

- **entries** (*Iterable[str]*) – 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.

`darc.db.QR_LOCK: multiprocessing.Lock`
I/O lock for the `requests` database `_queue_requests.txt`.

See also:

- `darc.db.save_requests()`

`darc.db.QS_LOCK: Union[multiprocessing.Lock, threading.Lock, contextlib.nullcontext]`
I/O lock for the `selenium` database `_queue_selenium.txt`.

If `FLAG_MP` is `True`, it will be an instance of `multiprocessing.Lock`. If `FLAG_TH` is `True`, it will be an instance of `threading.Lock`. If none above, it will be an instance of `contextlib.nullcontext`.

See also:

- `darc.db.save_selenium()`
- `darc.const.FLAG_MP`
- `darc.const.FLAG_TH`

1.7 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`.

`darc.submit.get_html(link, time)`
Read HTML document.

Parameters

- **link** (`darc.link.Link`) – Link object to read document from `selenium`.
- **time** (*str*) –

Returns

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

Return type `Optional[Dict[str, Union[str, ByteString]]]`**See also:**

- `darc.crawl.loader()`
- `darc.save.save_html()`

`darc.submit.get_metadata(link)`

Generate metadata field.

Parameters `link` (`darc.link.Link`) – Link object to generate metadata.**Returns**

The metadata from link.

- url – original URL, `link.url`
- proxy – proxy type, `link.proxy`
- host – hostname, `link.host`
- base – base path, `link.base`
- name – link hash, `link.name`

Return type `Dict[str, str]``darc.submit.get_raw(link, time)`

Read raw document.

Parameters

- `link` (`darc.link.Link`) – Link object to read document from `requests`.
- `time` (`str`) –

Returns

- If document exists, return the data from document.
 - path – relative path from document to root of data storage `PATH_DB`, `<proxy>/<scheme>/<hostname>/<hash>_<timestamp>_raw.html` or `<proxy>/<scheme>/<hostname>/<hash>_<timestamp>.dat`
 - data – *base64* encoded content of document
- If not, return `None`.

Return type `Optional[Dict[str, Union[str, ByteString]]]`**See also:**

- `darc.crawl.crawler()`
- `darc.save.save_html()`

- `darc.save.save_file()`

`darc.submit.get_robots(link)`

Read robots.txt.

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

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.

Return type `Optional[Dict[str, Union[str, ByteString]]]`

See also:

- `darc.crawl.crawler()`
- `darc.save.save_robots()`

`darc.submit.get_screenshot(link, time)`

Read screenshot picture.

Parameters

- `link` (`darc.link.Link`) – Link object to read screenshot from `selenium`.
- `time` (`str`) –

Returns

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

Return type `Optional[Dict[str, Union[str, ByteString]]]`

See also:

- `darc.crawl.loader()`

`darc.submit.get_sitemap(link)`

Read sitemaps.

Parameters `link` (`darc.link.Link`) – Link object to read sitemaps.

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.

Return type Optional[List[Dict[str, Union[str, ByteString]]]]

See also:

- `darc.crawl.crawler()`
- `darc.save.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.

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.

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)`

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** (darc.link.Link) – Link object of submission.

If `API_NEW_HOST` 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_
    ↪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": ...
  },
  // 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>.txt
      "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_metadata()`
- `darc.submit.get_robots()`
- `darc.proxy.i2p.get_hosts()`

`darc.submit.submit_requests(time, link, response, session)`
Submit requests data.

When crawling, we'll first fetch the URI 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** (`darc.link.Link`) – Link object of submission.
- **response** (`requests.Response`) – Response object of submission.
- **session** (`requests.Session`) – Session object of submission.

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": ...
  },
  // 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
```

(continues on next page)

(continued from previous page)

```

    "Reason": ...,
    // response cookies (if any)
    "Cookies": {
        ...
    },
    // session cookies (if any)
    "Session": {
        ...
    },
    // request headers (if any)
    "Request": {
        ...
    },
    // response headers (if any)
    "Response": {
        ...
    },
    // 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": ...,
    }
}

```

See also:

- `darc.submit.API_REQUESTS`
- `darc.submit.submit()`
- `darc.submit.save_submit()`
- `darc.submit.get_metadata()`
- `darc.submit.get_raw()`
- `darc.crawl.crawler()`

`darc.submit.submit_selenium(time, link)`

Submit selenium data.

After crawling with `requests`, we'll then render the URI 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** (`darc.link.Link`) – Link object of submission.

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_
    ↪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": ...
  },
  // 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": ...,
  }
}
```

See also:

- `darc.submit.API_SELENIUM`
- `darc.submit.submit()`
- `darc.submit.save_submit()`
- `darc.submit.get_metadata()`

- `darc.submit.get_html()`
- `darc.submit.get_screenshot()`
- `darc.crawl.loader()`

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

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

See also:

- `darc.const.PATH_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`.

1.8 Requests Wrapper

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

`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` (`darc.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`

1.9 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.

Returns The desied capabilities for the web driver `selenium.webdriver.Chrome`.

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

Return type `dict`

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 `selenium.webdriver.Chrome`.

Return type `selenium.webdriver.ChromeOptions`

Raises

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

See also:

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

References

- <https://peter.sh/experiments/chromium-command-line-switches/>
 - <https://crbug.com/638180>; <https://stackoverflow.com/a/50642913/7218152>
 - <http://crbug.com/715363>
 - <https://www.chromium.org/developers/design-documents/network-stack/socks-proxy>
-

`darc.selenium.i2p_driver ()`

I2P (.i2p) driver.

Returns The web driver object with I2P proxy settings.

Return type `selenium.webdriver.Chrome`

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`

See also:

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

`darc.selenium.request_driver (link)`

Get selenium driver.

Parameters `link` (`darc.link.Link`) – Link requesting for `selenium.webdriver.Chrome`.

Returns The web driver object with corresponding proxy settings.

Return type `selenium.webdriver.Chrome`

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`

See also:

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

1.10 Proxy Utilities

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

1.10.1 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` (`darc.link.Link`) – Link object representing the bitcoin address.

`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`

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

1.10.2 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` (`darc.link.Link`) – Link object representing the data URI.

`darc.proxy.data.PATH = '{PATH_MISC}/data/'`
Path to the data storage of data URI schemes.

See also:

- `darc.const.PATH_MISC`

1.10.3 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` (`darc.link.Link`) – Link object representing the ED2K magnet links.

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

1.10.4 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.

See also:

- `darc.proxy.freenet.freenet_bootstrap()`
- `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.

See also:

- `darc.proxy.freenet.__freenet_bootstrap()`
- `darc.proxy.freenet.FREENET_RETRY`
- `darc.proxy.freenet.__FREENET_BS_FLAG`

`darc.proxy.freenet.has_freenet(link_pool)`

Check if contain Freenet links.

Parameters `link_pool` (`Iterable[str]`) – Link pool to check.

Returns If the link pool contains Freenet links.

Return type bool

See also:

- `darc.link.parse_link()`
- `darc.link.urlparse()`
- `darc.proxy.freenet.FREENET_PORT`

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._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.

1.10.5 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.CallProcessError` – If the return code of *_I2P_PROC* is non-zero.

See also:

- `darc.proxy.i2p.i2p_bootstrap()`
- `darc.proxy.i2p.BS_WAIT`
- `darc.proxy.i2p._I2P_BS_FLAG`
- `darc.proxy.i2p._I2P_PROC`

`darc.proxy.i2p.fetch_hosts(link)`

Fetch `hosts.txt`.

Parameters `link` (`darc.link.Link`) – Link object to fetch for its `hosts.txt`.

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

Read `hosts.txt`.

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

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`.

Return type `Optional[Dict[str, Union[str, ByteString]]]`

See also:

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

`darc.proxy.i2p.has_hosts(link)`

Check if `hosts.txt` already exists.

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

Returns

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

Return type `Optional[str]`

`darc.proxy.i2p.has_i2p(link_pool)`

Check if contain I2P links.

Parameters `link_pool` (`Set[str]`) – Link pool to check.

Returns If the link pool contains I2P links.

Return type `bool`

See also:

- `darc.link.parse_link()`
- `darc.link.urlparse()`

`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.

See also:

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

`darc.proxy.i2p.read_hosts(text, check=False)`
Read `hosts.txt`.

Parameters

- **text** (`Iterable[str]`) – Content of `hosts.txt`.
- **check** (`bool`) – If perform checks on extracted links, default to `CHECK`.

Returns List of links extracted.

Return type `Iterable[str]`

`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`.

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

Return type `str`

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.Proxy`
Proxy (`selenium.webdriver.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._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.

1.10.6 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` (`darc.link.Link`) – Link object representing the IRC address.

`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`

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

1.10.7 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` (`darc.link.Link`) – Link object representing the magnet link

`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`

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

1.10.8 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` (`darc.link.Link`) – Link object representing the email address.

`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`

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

1.10.9 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)`

Fetch sitemap.

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

Parameters `link` (`darc.link.Link`) – Link object to fetch for its sitemaps.

See also:

- `darc.parse.read_robots()`
- `darc.parse.read_sitemap()`
- `darc.parse.get_sitemap()`

`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` (`darc.link.Link`) – Link object representing the link with invalid scheme.

`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`

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

1.10.10 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.

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`

`darc.proxy.tor.has_tor(link_pool)`

Check if contain Tor links.

Parameters `link_pool` (`Set[str]`) – Link pool to check.

Returns If the link pool contains Tor links.

Return type `bool`

See also:

- `darc.link.parse_link()`
- `darc.link.urlparse()`

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

Print Tor bootstrap lines.

Parameters `line` (`str`) – Tor bootstrap line.

`darc.proxy.tor.renew_tor_session()`

Renew Tor session.

`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.

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.Proxy`

Proxy (`selenium.webdriver.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_STEM: bool`

If manage the Tor proxy through `stem`.

Default True

Environ `TOR_STEM`

`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._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()`.

1.10.11 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.

See also:

- `darc.proxy.zeronet.zeronet_bootstrap()`
- `darc.proxy.zeronet.BS_WAIT`
- `darc.proxy.zeronet._ZERONET_BS_FLAG`
- `darc.proxy.zeronet._ZERONET_PROC`

`darc.proxy.zeronet.has_zeronet(link_pool)`
Check if contain ZeroNet links.

Parameters `link_pool (Set[str])` – Link pool to check.

Returns If the link pool contains ZeroNet links.

Return type `bool`

See also:

- `darc.link.parse_link()`
- `darc.link.urlparse()`
- `darc.proxy.zeronet.ZERONET_PORT`

`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.

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._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 `selenium.webdriver.Chrome` objects, you can specify such information in the `darc.proxy.LINK_MAP` mapping dictionary.

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

```
LINK_MAP = collections.defaultdict(
    lambda: (darcc.requests.null_session, darcc.selenium.null_driver),
    dict(
        tor=(darcc.requests.tor_session, darcc.selenium.tor_driver),
        i2p=(darcc.requests.i2p_session, darcc.selenium.i2p_driver),
    )
)
```

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

The fallback value is the no proxy `requests.Session` object (`null_session()`) and `selenium.webdriver.Chrome` object (`null_driver()`).

See also:

- `darcc.requests` – `requests.Session` factory functions
- `darcc.selenium` – `selenium.webdriver.Chrome` factory functions

1.11 Sites Customisation

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

1.11.1 Default Hooks

The `darcc.sites.default` module is the fallback for sites customisation.

`darcc.sites.default.crawler(session, link)`

Default crawler hook.

Parameters

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

Returns The final response object with crawled data.

Return type `requests.Response`

See also:

- `darcc.crawl.crawler()`

`darcc.sites.default.loader(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

- **driver** (`selenium.webdriver.Chrome`) – Web driver object with proxy settings.
- **link** (`darcc.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`

To customise behaviours over `requests`, you sites customisation module should have a `crawler()` function, e.g. `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(link, session)`

Customisation as to `requests` sessions.

Parameters

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

Returns The final response object with crawled data.

Return type `requests.Response`

See also:

- `darc.sites.SITE_MAP`
- `darc.sites._get_spec()`
- `darc.crawl.crawler()`

To customise behaviours over `selenium`, you sites customisation module should have a `loader()` function, e.g. `loader()`.

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

`darc.sites.loader_hook(link, driver)`

Customisation as to `selenium` drivers.

Parameters

- **link** (`darc.link.Link`) – Link object to be loaded.
- **driver** (`selenium.webdriver.Chrome`) – Web driver object with proxy settings.

Returns The web driver object with loaded data.

Return type `selenium.webdriver.Chrome`

See also:

- `darc.sites.SITE_MAP`
- `darc.sites._get_spec()`

- `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.

`darc.sites.SITEMAP: DefaultDict[str, str]`

```
SITEMAP = collections.defaultdict(lambda: 'default', {
    # 'www.sample.com': 'sample', # darc.sites.sample
})
```

The mapping dictionary for hostname to sites customisation modules.

The fallback value is `default`, c.f. `darc.sites.default`.

`darc.sites._get_spec(link)`

Load spec if any.

If the sites customisation failed to import, it will fallback to the default hooks, `default`.

Parameters `link` (`darc.link.Link`) – Link object to fetch sites customisation module.

Returns The sites customisation module.

Return type `types.ModuleType`

Warns `SiteNotFoundWarning` – If the sites customisation failed to import.

See also:

- `darc.sites.SITEMAP`

1.12 Module Constants

1.12.1 Auxiliary Function

`darc.const.getpid()`

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.

Returns The process ID.

Return type `int`

See also:

- `darc.const.PATH_ID`

1.12.2 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.

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 direcorey.

`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`

1.12.3 Data Storage

`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_QR = '{PATH_DB}/_queue_requests.txt'`
Path to the `requests` database, `_queue_requests.txt`.

See also:

- `darc.const.PATH_DB`
- `darc.db.load_requests()`
- `darc.db.save_requests()`

`darc.const.PATH_QS = '{PATH_DB}/_queue_selenium.txt'`
 Path to the `selenium` database, `_queue_selenium.txt`.

See also:

- `darc.const.PATH_DB`
- `darc.db.load_selenium()`
- `darc.db.save_selenium()`

`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()`

1.12.4 Web Crawlers

`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 long 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()`

1.12.5 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.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.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**.

1.13 Custom Exceptions

The `render_error()` function can be used to render multi-line error messages with `stem.util.term` colours.

The darc project provides following custom exceptions:

- *UnsupportedLink*
- *UnsupportedPlatform*
- *UnsupportedProxy*

The darc project provides following custom exceptions:

- *TorBootstrapFailed*
- *I2PBootstrapFailed*
- *ZeroNetBootstrapFailed*
- *FreenetBootstrapFailed*
- *APIRequestFailed*
- *SiteNotFoundWarning*

exception `darc.error.APIRequestFailed`

Bases: `Warning`

API submit failed.

exception `darc.error.FreenetBootstrapFailed`

Bases: `Warning`

Freenet bootstrap process failed.

exception `darc.error.I2PBootstrapFailed`

Bases: `Warning`

I2P bootstrap process failed.

exception `darc.error.SiteNotFoundWarning`

Bases: `ImportWarning`

Site customisation not found.

exception `darc.error.TorBootstrapFailed`

Bases: `Warning`

Tor bootstrap process failed.

exception `darc.error.UnsupportedLink`

Bases: `Exception`

The link is not supported.

exception `darc.error.UnsupportedPlatform`

Bases: `Exception`

The platform is not supported.

exception `darc.error.UnsupportedProxy`

Bases: `Exception`

The proxy is not supported.

exception `darc.error.ZeroNetBootstrapFailed`

Bases: `Warning`

ZeroNet bootstrap process failed.

`darc.error.render_error(message, colour)`

Render error message.

The function wraps the `stem.util.term.format()` function to provide multi-line formatting support.

Parameters

- **message** (*str*) – Multi-line message to be rendered with `colour`.
- **colour** (*stem.util.term.Color*) – Front colour of text, c.f. `stem.util.term.Color`.

Returns The rendered error message.

Return type `str`

As the websites can be sometimes irritating for their anti-robots verification, login requirements, etc., the `darc` project also provides 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-knife, only the main entrypoint function `darc.process.process()` is exported in global namespace (and renamed to `darc.darc()`), see below:

`darc.darc()`

Main process.

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

The general process can be described as following:

0. `process()`: obtain URLs from the `requests` link database (c.f. `load_requests()`), and feed such URLs to `crawler()` with *multiprocessing* support.
1. `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`), darc will save the document using `save_html()` or `save_file()` accordingly. And if the submission API is provided, `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()`).

2. `process()`: after the obtained URLs have all been crawled, 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.

3. `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 `selenium.webdriver.Chrome` object.

If successful, the rendered source HTML document will be saved using `save_html()`, 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()`).

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 is designed as a swiss-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.

The general process of darc can be described as following:

0. `process()`: obtain URLs from the `requests` link database (c.f. `load_requests()`), and feed such URLs to `crawler()` with `multiprocessing` support.
1. `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`), darc will save the document using `save_html()` or `save_file()` accordingly. And if the submission API is provided, `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()`).

2. `process()`: after the obtained URLs have all been crawled, 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.

3. `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 `selenium.webdriver.Chrome` object.

If successful, the rendered source HTML document will be saved using `save_html()`, 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()`).

INSTALLATION

Note: `darc` supports Python all versions above and includes **3.8**. Currently, it only supports and is tested on Linux (Ubuntu 18.04) and macOS (Catalina).

```
pip install darc
```

Please make sure you have Google Chrome and corresponding version of Chrome Driver installed on your system.

However, the `darc` project is shipped with Docker and Compose support. Please see the project root for relevant files and more information.

USAGE

The darc project provides a simple CLI:

```
usage: darc [-h] [-f FILE] ...

darkweb swiss knife crawler

positional arguments:
  link                  links to crawl

optional arguments:
  -h, --help            show this help message and exit
  -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.

CONFIGURATION

Though simple CLI, the `darc` project is more configurable by environment variables.

4.1 General Configurations

DARC_REBOOT: bool (int)

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.

Default 0

DARC_DEBUG: bool (int)

If run the program in debugging mode.

Default 0

DARC_VERBOSE: bool (int)

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

Default 0

DARC_FORCE: bool (int)

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

Default 0

DARC_CHECK: bool (int)

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`.

Default 0

DARC_CHECK_CONTENT_TYPE: bool (int)

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

Default 0

DARC_CPU: int

Number of concurrent processes. If not provided, then the number of system CPUs will be used.

Default None

DARC_MULTIPROCESSING: bool (int)

If enable *multiprocessing* support.

Default 1

DARC_MULTITHREADING: `bool (int)`

If enable *multithreading* support.

Default 0

Note: `DARC_MULTIPROCESSING` and `DARC_MULTITHREADING` can **NOT** be toggled at the same time.

DARC_USER: `str`

Non-root user for proxies.

Default current login user (c.f. `getpass.getuser()`)

4.2 Data Storage

PATH_DATA: `str (path)`

Path to data storage.

Default `data`

See also:

See `darc.save` for more information about source saving.

4.3 Web Crawlers

TIME_CACHE: `float`

Time delta for caches in seconds.

The `darc` project supports *caching* for fetched files. `TIME_CACHE` will specify for how long 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

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

4.4 White / Black Lists

LINK_WHITE_LIST: List[str] (json)

White list of hostnames should be crawled.

Default []

Note: Regular expressions are supported.

LINK_BLACK_LIST: List[str] (json)

Black list of hostnames should be crawled.

Default []

Note: Regular expressions are supported.

MIME_WHITE_LIST: List[str] (json)

White list of content types should be crawled.

Default []

Note: Regular expressions are supported.

MIME_BLACK_LIST: List[str] (json)

Black list of content types should be crawled.

Default []

Note: Regular expressions are supported.

PROXY_WHITE_LIST: List[str] (json)

White list of proxy types should be crawled.

Default []

Note: The proxy types are **case insensitive**.

PROXY_BLACK_LIST: List[str] (json)

Black list of proxy types should be crawled.

Default []

Note: The proxy types are **case insensitive**.

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.

4.5 Data Submission

API_RETRY: int

Retry times for API submission when failure.

Default 3

API_NEW_HOST: str

API URL for `submit_new_host()`.

Default None

API_REQUESTS: str

API URL for `submit_requests()`.

Default None

API_SELENIUM: str

API URL for `submit_selenium()`.

Default None

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`.

4.6 Tor Proxy Configuration

TOR_PORT: int

Port for Tor proxy connection.

Default 9050

TOR_CTRL: int

Port for Tor controller connection.

Default 9051

TOR_STEM: bool (int)

If manage the Tor proxy through `stem`.

Default 1

TOR_PASS: str

Tor controller authentication token.

Default None

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

TOR_RETRY: int

Retry times for Tor bootstrap when failure.

Default 3

TOR_WAIT: float

Time after which the attempt to start Tor is aborted.

Default 90

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

TOR_CFG: Dict[str, Any] (json)

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

Default {}

Note: If provided, it should be a JSON encoded string.

4.7 I2P Proxy Configuration

I2P_PORT: int

Port for I2P proxy connection.

Default 4444

I2P_RETRY: int

Retry times for I2P bootstrap when failure.

Default 3

I2P_WAIT: float

Time after which the attempt to start I2P is aborted.

Default 90

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

I2P_ARGS: str (shell)

I2P bootstrap arguments for `i2prouter start`.

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

Default ''

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

4.8 ZeroNet Proxy Configuration

ZERONET_PORT: int

Port for ZeroNet proxy connection.

Default 4444

ZERONET_RETRY: int

Retry times for ZeroNet bootstrap when failure.

Default 3

ZERONET_WAIT: float

Time after which the attempt to start ZeroNet is aborted.

Default 90

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

ZERONET_PATH: str (path)

Path to the ZeroNet project.

Default /usr/local/src/zernet

ZERONET_ARGS: str (shell)

ZeroNet bootstrap arguments for ZeroNet.sh main.

Default ''

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

4.9 Freenet Proxy Configuration

FREENET_PORT: int

Port for Freenet proxy connection.

Default 8888

FREENET_RETRY: int

Retry times for Freenet bootstrap when failure.

Default 3

FREENET_WAIT: float

Time after which the attempt to start Freenet is aborted.

Default 90

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

FREENET_PATH: str (path)

Path to the Freenet project.

Default /usr/local/src/freenet

FREENET_ARGS: str (shell)

Freenet bootstrap arguments for run.sh start.

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

Default ''

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

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