
darc

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CONTENTS

1	Darkweb Crawler Project	1
1.1	URL Utilities	1
1.2	Source Parsing	4
1.3	Link Database	7
1.4	Proxy Utilities	11
1.5	Sites Customisation	20
1.6	Module Constants	22
1.7	Custom Exceptions	26
2	Docker Integration	29
3	Web Backend Demo	39
4	Data Models Demo	45
5	Auxiliary Scripts	49
5.1	Health Check	49
5.2	Upload API Submission Files	49
5.3	Remove Repeated Lines	50
6	Installation	53
7	Usage	55
8	Configuration	57
8.1	General Configurations	57
8.2	Data Storage	58
8.3	Web Crawlers	60
8.4	White / Black Lists	61
8.5	Data Submission	63
8.6	Tor Proxy Configuration	63
8.7	I2P Proxy Configuration	64
8.8	ZeroNet Proxy Configuration	65
8.9	Freenet Proxy Configuration	66
9	Indices and tables	69
	Python Module Index	71
	Index	73

DARKWEB CRAWLER PROJECT

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.

1.1 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, url_parse, host, base, name)
```

Bases: *object*

Parsed link.

Parameters

- **url** – original link
- **proxy** – proxy type
- **host** – URL's hostname
- **base** – base folder for saving files
- **name** – hashed link for saving files
- **url_parse** – 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
```

base folder for saving files

```
host: str
```

URL's hostname

name: `str`
hashed link for saving files

proxy: `str`
proxy type

url: `str`
original link

url_parse: `urllib.parse.ParseResult`
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.

1.2 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[darc.link.Link]`) – List of links to be checked.

Returns List of links matches the requirements.

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

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[darc.link.Link]`) – List of links to be checked.

Returns List of links matches the requirements.

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

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` (`darc.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`.

Returns List of extracted links.

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

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.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.const.LINK_FALLBACK`

`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.const.MIME_FALLBACK`

`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.const.PROXY_FALLBACK`

`darc.save._SAVE_LOCK: Union[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()`

1.3 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 convention with `queue_` prefix:

- the hostname database – `queue_hostname`
- the *requests* database – `queue_requests`
- the *selenium* database – `queue_selenium`

For `queue_hostname`, it is a *Redis set* data type; and for `queue_requests` and `queue_selenium`, they are both *Redis sorted set* data type.

`darc.db.drop_hostname(link)`

Remove link from the hostname database.

The function updates the `queue_hostname` database.

Parameters `link` (`darc.link.Link`) – Link to be removed.

`darc.db.drop_requests(link)`

Remove link from the *requests* database.

The function updates the `queue_requests` database.

Parameters `link` (`darc.link.Link`) – Link to be removed.

`darc.db.drop_selenium(link)`

Remove link from the *selenium* database.

The function updates the `queue_selenium` database.

Parameters `link` (`darc.link.Link`) – Link to be removed.

`darc.db.get_lock(name, timeout=None, sleep=0.1, blocking_timeout=None, lock_class=None, thread_local=True)`

Get a lock for Redis operations.

Parameters

- **name** (*str*) – Lock name.
- **timeout** (*Optional[float]*) – Maximum life for the lock.
- **sleep** (*float*) – Amount of time to sleep per loop iteration when the lock is in blocking mode and another client is currently holding the lock.
- **blocking_timeout** (*Optional[float]*) – Maximum amount of time in seconds to spend trying to acquire the lock.
- **lock_class** (*Optional[redis.lock.Lock]*) – Lock implementation.
- **thread_local** (*bool*) – Whether the lock token is placed in thread-local storage.

Returns Return a new `redis.lock.Lock` object using key name that mimics the behavior of `threading.Lock`.

Return type Union[`redis.lock.Lock`, `contextlib.nullcontext`]

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

`darc.db.have_hostname(link)`

Check if current link is a new host.

The function checks the `queue_hostname` database.

Parameters `link` (`darc.link.Link`) – Link to check against.

Returns If such link is a new host.

Return type `bool`

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

Load link from the `requests` database.

The function reads the `queue_requests` database.

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

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

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

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

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

Load link from the `selenium` database.

The function reads the `queue_selenium` database.

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

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

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

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** – Arbitrary arguments for the Redis command.

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

Returns Values returned from the Redis command.

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

Return type Any

See also:

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

`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** (`List[darc.link.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** – Score to for the Redis sorted set.
- **nx** – Forces `ZADD` to only create new elements and not to update scores for elements that already exist.
- **xx** – Forces `ZADD` to only update scores of elements that already exist. New elements will not be added.

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.save_selenium(entries, single=False, score=None, nx=False, xx=False)`

Save link to the `selenium` database.

The function updates the `queue_selenium` database.

Parameters

- **entries** (`List[darc.link.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** – Score to for the Redis sorted set.
- **nx** – Forces `ZADD` to only create new elements and not to update scores for elements that already exist.
- **xx** – Forces `ZADD` to only update scores of elements that already exist. New elements will not be added.

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.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: Optional[float]`

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.REDIS_RETRY: int`

Default 10

Environ DARC_REDIS_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()`.

`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.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.

1.4 Proxy Utilities

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

`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: Union[multiprocessing.Lock, threading.Lock, contextlib.nullcontext]`

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

See also:

- `darc.const.get_lock()`

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

See also:

- `darc.const.PATH_MISC`

`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: Union[multiprocessing.Lock, threading.Lock, contextlib.nullcontext]`
I/O lock for saving ED2K magnet links `PATH`.

See also:

- `darc.const.get_lock()`

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.

1.4.1 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`.

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`.

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:

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

`darcs.proxy.i2p.have_hosts(link)`

Check if `hosts.txt` already exists.

Parameters `link` (`darcs.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]

`darcs.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:

- `darcs.proxy.i2p.__i2p_bootstrap()`
- `darcs.proxy.i2p.I2P_RETRY`
- `darcs.proxy.i2p.__I2P_BS_FLAG`

`darcs.proxy.i2p.read_hosts(text, check=False)`

Read `hosts.txt`.

Parameters

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

Returns List of links extracted.

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

`darcs.proxy.i2p.save_hosts(link, text)`

Save `hosts.txt`.

Parameters

- `link` (`darcs.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._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.

`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: Union[multiprocessing.Lock, threading.Lock, contextlib.nullcontext]`

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

See also:

- `darc.const.get_lock()`

`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: Union[multiprocessing.Lock, threading.Lock, contextlib.nullcontext]`

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

See also:

- `darc.const.get_lock()`

`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: Union[multiprocessing.Lock, threading.Lock, contextlib.nullcontext]`

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

See also:

- `darc.const.get_lock()`

`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: Union[multiprocessing.Lock, threading.Lock, contextlib.nullcontext]`
I/O lock for saving links with invalid scheme *PATH*.

See also:

- `darc.const.get_lock()`

`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: Union[multiprocessing.Lock, threading.Lock, contextlib.nullcontext]`
I/O lock for saving JavaScript links *PATH*.

See also:

- `darc.const.get_lock()`

`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: Union[multiprocessing.Lock, threading.Lock, contextlib.nullcontext]`
I/O lock for saving telephone numbers *PATH*.

See also:

- `darc.const.get_lock()`

`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_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 `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()`.

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 **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: (darc.requests.null_session, darc.selenium.null_driver),  
    dict(  
        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 Chrome factory function.

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

See also:

- `darc.requests` – `requests.Session` factory functions
- `darc.selenium` – Chrome factory functions

1.5 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.

```
# -*- coding: utf-8 -*-  
"""Default Hooks  
=====
```

The :mod:`darc.sites.default` module is the fallback for sites customisation.

```
"""  
  
import time  
  
import darc.typing as typing  
from darc.const import SE_WAIT  
from darc.link import Link  
  
def crawler(session: typing.Session, link: Link) -> typing.Response:  
    """Default crawler hook.  
  
    Args:  
        session (requests.Session): Session object with proxy settings.  
        link: Link object to be crawled.  
  
    Returns:  
        requests.Response: The final response object with crawled data.
```

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```

See Also:
    * :func:`darc.crawl.crawler`

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

def loader(driver: typing.Driver, link: Link) -> typing.Driver:
    """Default loader hook.

    When loading, if :data:`~darc.const.SE_WAIT` is a valid time lapse,
    the function will sleep for such time to wait for the page to finish
    loading contents.

    Args:
        driver (selenium.webdriver.Chrome): Web driver object with proxy settings.
        link: Link object to be loaded.

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

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

        .. |event| replace:: ``DOMContentLoaded``
        .. _event: https://developer.mozilla.org/en-US/docs/Web/API/Window/
        ↪DOMContentLoaded_event

    See Also:
        * :func:`darc.crawl.loader`
        * :data:`darc.const.SE_WAIT`

    """
    driver.get(link.url)

    # wait for page to finish loading
    if SE_WAIT is not None:
        time.sleep(SE_WAIT)

    return driver

```

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.

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

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

1.6 Module Constants

1.6.1 Auxiliary Function

`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 directory.

`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`

`darc.const.REDIS: redis.Redis`

URL to the Redis database.

Default `redis://127.0.0.1`

Environ `REDIS_URL`

See also:

See `darc.db` for more information about Redis database integration.

`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()`

`darc.const.DARC_WAIT: Optional[float]`
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 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()`

```
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*

1.7 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:

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

The *darc* project provides following custom exceptions:

- *TorBootstrapFailed*
- *I2PBootstrapFailed*
- *ZeroNetBootstrapFailed*
- *FreenetBootstrapFailed*
- *APIRequestFailed*
- *SiteNotFoundWarning*
- *LockWarning*
- *TorRenewFailed*
- *RedisCommandFailed*

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.LinkNoReturn`
Bases: `Exception`
The link has no return value from the hooks.

exception `darc.error.LockWarning`
Bases: `Warning`
Failed to acquire Redis lock.

exception `darc.error.RedisCommandFailed`
Bases: `Warning`
Redis command execution failed.

exception `darc.error.SiteNotFoundWarning`
Bases: `ImportWarning`
Site customisation not found.

exception `darc.error.TorBootstrapFailed`
Bases: `Warning`
Tor bootstrap process failed.

exception `darc.error.TorRenewFailed`
Bases: `Warning`
Tor renew request 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 army knife, only the main entrypoint function `darc.process.process()` is exported in global namespace (and renamed to `darc.darc()`), see below:

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:bionic

LABEL Name=darc \
      Version=0.5.0.post1

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
COPY extra/install.py /usr/local/bin/pty-install
COPY vendor/jdk-11.0.7_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 \
```

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```

    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 \
    python3.8 \
    python3-pip \
    python3-setuptools \
    python3-wheel \
&& ln -sf /usr/bin/python3.8 /usr/local/bin/python3
RUN retry pty-install --stdin '6\n70' apt-get install --yes --no-install-recommends \
    tzdata \
&& 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.bionic /etc/tor/torrc

## I2P
RUN retry apt-get install --yes --no-install-recommends i2p
COPY extra/i2p.bionic /etc/defaults/i2p

## ZeroNet
COPY vendor/ZeroNet-py3-linux64.tar.gz /tmp
RUN set -x \
&& cd /tmp \
&& tar xvpfz ZeroNet-py3-linux64.tar.gz \
&& mv ZeroNet-linux-dist-linux64 /usr/local/src/zeronet
COPY extra/zeronet.bionic.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

```

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```

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_linux64-79.0.3945.36.zip \
  vendor/google-chrome-stable_current_amd64.deb /tmp/
RUN set -x \
  ## ChromeDriver
  && unzip -d /usr/bin /tmp/chromedriver_linux64-79.0.3945.36.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
    /tmp/chromedriver_linux64-79.0.3945.36.zip \
    ## Google Chrome
    /tmp/google-chrome-stable_current_amd64.deb \
    ## Vendors
    /tmp/new_installer_offline.jar \
    /tmp/noip-duc-linux.tar.gz \
    /tmp/ZeroNet-py3-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" ]

```

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```
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
import sys
import tempfile

def get_parser():
    """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():
    """Entrypoint."""
    parser = get_parser()
    args = parser.parse_args()
    text = args.stdin.encode().decode('unicode_escape')
```

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```

path = tempfile.mktemp(prefix='install-')
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

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:
      # non-root user
      DARC_USER: "darc"
    container_name: crawler
    #entrypoint: [ "bash", "/app/run.sh" ]
    command: [ "--type", "crawler",
               "--file", "/app/text/market.txt",
               "--file", "/app/text/top-20k.txt",
               "--file", "/app/text/i2p.txt",
               "--file", "/app/text/zeronet.txt",
               "--file", "/app/text/freenet.txt" ]
    depends_on: &depends_on
      - redis
    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

```

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```

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
# data storage
PATH_DATA: "data"
# Redis URL
REDIS_URL: 'redis://'
↪:UCf7y123aHgaYeGnvLRasALjFfDVHGCz6KiR5Z0WC0DL4ExvSGw5SkcOxBywc0qtZBHVrSVx2QMGewXNP6qVow@redis
↪'

# 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
FRENET_PORT: 8888
# Freenet bootstrap retry
FRENET_RETRY: 0
# Freenet project path

```

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```

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: '[ "(.*\\.\\.)?facebookcorewwi\\.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" ]'
# 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" ]
depends_on: *depends_on
environment:
## [PYTHON] force the stdout and stderr streams to be unbuffered

```

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```

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: 1
# multiprocessing
DARC_MULTIPROCESSING: 0
# multithreading
DARC_MULTITHREADING: 0
# time lapse
DARC_WAIT: 60
# data storage
PATH_DATA: "data"
# Redis URL
REDIS_URL: 'redis://
↳:UCf7y123aHgaYeGnvLRasALjFfdVHGCz6KiR5Z0WC0DL4ExvSGw5SskOxBywc0qtZBHVrSVx2QMGewXNP6qVow@redis
↳'

# 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

```

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```

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: '[ "(.*\\.)?facebookcorewwi\\.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" ]'
# 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
volumes: *volumes

```

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```
redis:
  image: redis:darc
  build:
    context: .
    dockerfile: extra/redis.dockerfile
  container_name: redis
  expose:
    - 6379
  restart: "always"
  networks: *networks
  volumes:
    - /data/darc/redis:/data

# 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.

WEB BACKEND DEMO

This is a demo of API for communication between the *darc* crawlers (*darc.submit*) and web UI.

Assuming the web UI is developed using the *Flask* microframework.

```
# -*- coding: utf-8 -*-

import flask # pylint: disable=import-error

# Flask application
app = flask.Flask(__file__)

@app.route('/api/new_host', methods=['POST'])
def new_host():
    """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::

        {
            // 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": ...,
```

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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>.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": ...,
        }
    }

    """
    # JSON data from the request
    data = flask.request.json # pylint: disable=unused-variable

    # do whatever processing needed
    ...

@app.route('/api/requests', methods=['POST'])
def from_requests():
    """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": ...,

```

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```

        // 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": ...,
    // request method
    "Method": "GET",
    // response status code
    "Status-Code": ...,
    // response reason
    "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": ...,
    },
    // redirection history (if any)
    "History": [
        // same records as the original response
        {"...": "..."}
    ]
}

"""

```

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```

# JSON data from the request
data = flask.request.json # pylint: disable=unused-variable

# do whatever processing needed
...

@app.route('/api/selenium', methods=['POST'])
def from_selenium():
    """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.

    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": ...
            },
            // 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

```

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```
        "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
...

if __name__ == "__main__":
    flask.run()
```


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.

```
# -*- coding: utf-8 -*-

import datetime
import os

import peewee
import playhouse.shortcuts

# database client
DB = playhouse.db_url.connect(os.getenv('DB_URL', 'mysql://127.0.0.1'))

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.

    Returns:
        Generated table name.

    """
    name: str = model_class.__name__
    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
```

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```

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):
        """Convert record to :obj:`dict`.

        Returns:
            The data converted through :func:`playhouse.shortcuts.model_to_dict`.

        """
        return playhouse.shortcuts.model_to_dict(self)

class HostnameModel(BaseModel):
    """Data model for a hostname record."""

    #: Hostname (c.f. :attr:`link.host` <darc.link.Link.host>`).
    hostname: str = peewee.TextField()
    #: Proxy type (c.f. :attr:`link.proxy` <darc.link.Link.proxy>`).
    proxy: str = peewee.CharField(max_length=8)

    #: Timestamp of first ``new_host`` submission.
    discovery: datetime.datetime = peewee.DateTimeField()
    #: Timestamp of last related submission.
    last_seen: datetime.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.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')

```

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```

#: Timestamp of the submission.
timestamp: datetime.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.datetime = peewee.DateTimeField()

    #: Document data as :obj:`bytes`.
    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.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)

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."""

```

(continues on next page)

(continued from previous page)

```
#: 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()
```

AUXILIARY SCRIPTS

Since the *darc* project can be deployed through *Docker Integration*, we provided some auxiliary scripts to help with the deployment.

5.1 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.

5.2 Upload API Submission Files

File location

- Entry point: `extra/upload.py`
- Helper script: `extra/upload.sh`
- System V service: `extra/upload.service`

```
usage: upload [-h] [-f FILE] [-p PATH] [-i INTERVAL] -H HOST [-U USER]

upload API submission files

optional arguments:
  -h, --help            show this help message and exit
  -f FILE, --file FILE  path to compose file
  -p PATH, --path PATH  path to data storage
  -i INTERVAL, --interval INTERVAL
                        interval (in seconds) to upload
  -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)`.

When uploading, the script will *pause* the running containers and it will *unpause* them upon completion.

5.3 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.

`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.

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 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()`).

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. Please make sure you have it 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]
```


USAGE

The *darc* project provides a simple CLI:

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

the darkweb crawling swiss army knife

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.

8.1 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_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.

8.2 Data Storage

See also:

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

See `darc.db` for more information about Redis 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.

DARC_BULK_SIZE

Type `int`

Default 100

Bulk size for updating Redis 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()`

`darc.db`.**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()`.

REDIS_RETRY

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()`.

8.3 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 long 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.

8.4 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.

8.5 Data Submission

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`.

8.6 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.

8.7 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`.

8.8 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()`).

8.9 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*.

INDICES AND TABLES

- `genindex`
- `modindex`
- `search`

PYTHON MODULE INDEX

d

- `darc`, [1](#)
- `darc.db`, [7](#)
- `darc.error`, [26](#)
- `darc.link`, [1](#)
- `darc.parse`, [4](#)
- `darc.proxy`, [11](#)
- `darc.proxy.i2p`, [13](#)
- `darc.sites`, [20](#)

Symbols

`__hash__()` (*darc.link.Link* method), 1
`_check()` (*in module darc.parse*), 4
`_check_ng()` (*in module darc.parse*), 4
`_i2p_bootstrap()` (*in module darc.proxy.i2p*), 13

A

`APIRequestFailed`, 26

B

`base` (*darc.link.Link* attribute), 1

C

`check_robots()` (*in module darc.parse*), 5

D

`darc`
 module, 1
`darc.const.CHECK` (*built-in variable*), 22
`darc.const.CHECK_NG` (*built-in variable*), 22
`darc.const.CWD` (*built-in variable*), 22
`darc.const.DARC_CPU` (*built-in variable*), 22
`darc.const.DARC_USER` (*built-in variable*), 23
`darc.const.DARC_WAIT` (*built-in variable*), 24
`darc.const.DEBUG` (*built-in variable*), 22
`darc.const.FLAG_MP` (*built-in variable*), 23
`darc.const.FLAG_TH` (*built-in variable*), 23
`darc.const.FORCE` (*built-in variable*), 22
`darc.const.LINK_BLACK_LIST` (*built-in variable*), 25
`darc.const.LINK_FALLBACK` (*built-in variable*), 25
`darc.const.LINK_WHITE_LIST` (*built-in variable*), 25
`darc.const.MIME_BLACK_LIST` (*built-in variable*), 25
`darc.const.MIME_FALLBACK` (*built-in variable*), 25
`darc.const.MIME_WHITE_LIST` (*built-in variable*), 25
`darc.const.PATH_DB` (*built-in variable*), 23
`darc.const.PATH_ID` (*built-in variable*), 24

`darc.const.PATH_LN` (*built-in variable*), 23
`darc.const.PATH_MISC` (*built-in variable*), 23
`darc.const.PATH_QR` (*built-in variable*), 23
`darc.const.PATH_QS` (*built-in variable*), 24
`darc.const.PROXY_BLACK_LIST` (*built-in variable*), 26
`darc.const.PROXY_FALLBACK` (*built-in variable*), 26
`darc.const.PROXY_WHITE_LIST` (*built-in variable*), 26
`darc.const.REBOOT` (*built-in variable*), 22
`darc.const.REDIS` (*built-in variable*), 23
`darc.const.ROOT` (*built-in variable*), 22
`darc.const.SE_EMPTY` (*built-in variable*), 25
`darc.const.SE_WAIT` (*built-in variable*), 24
`darc.const.TIME_CACHE` (*built-in variable*), 24
`darc.const.VERBOSE` (*built-in variable*), 22
`darc.db`
 module, 7
`darc.db.BULK_SIZE` (*in module darc.db*), 9
`darc.db.LOCK_TIMEOUT` (*in module darc.db*), 10
`darc.db.MAX_POOL` (*in module darc.db*), 10
`darc.db.REDIS_LOCK` (*built-in variable*), 59
`darc.db.REDIS_LOCK` (*in module darc.db*), 10
`darc.db.REDIS_RETRY` (*in module darc.db*), 10
`darc.error`
 module, 26
`darc.link`
 module, 1
`darc.parse`
 module, 4
`darc.proxy`
 module, 11
`darc.proxy.bitcoin.LOCK` (*built-in variable*), 11
`darc.proxy.bitcoin.PATH` (*built-in variable*), 11
`darc.proxy.data.PATH` (*built-in variable*), 11
`darc.proxy.ed2k.LOCK` (*built-in variable*), 12
`darc.proxy.ed2k.PATH` (*built-in variable*), 12
`darc.proxy.freenet._FRENET_ARGS` (*built-in variable*), 13
`darc.proxy.freenet._FRENET_BS_FLAG` (*built-in variable*), 13

darc.proxy.freenet._FREENET_PROC (built-in variable), 13

darc.proxy.freenet._MNG_FREENET (built-in variable), 13

darc.proxy.freenet.BS_WAIT (built-in variable), 12

darc.proxy.freenet.FREENET_ARGS (built-in variable), 12

darc.proxy.freenet.FREENET_PATH (built-in variable), 12

darc.proxy.freenet.FREENET_PORT (built-in variable), 12

darc.proxy.freenet.FREENET_RETRY (built-in variable), 12

darc.proxy.i2p
module, 13

darc.proxy.i2p._I2P_ARGS (in module darc.proxy.i2p), 16

darc.proxy.i2p._I2P_BS_FLAG (in module darc.proxy.i2p), 16

darc.proxy.i2p._I2P_PROC (in module darc.proxy.i2p), 16

darc.proxy.i2p._MNG_I2P (in module darc.proxy.i2p), 15

darc.proxy.i2p.BS_WAIT (in module darc.proxy.i2p), 15

darc.proxy.i2p.I2P_ARGS (in module darc.proxy.i2p), 15

darc.proxy.i2p.I2P_PORT (in module darc.proxy.i2p), 15

darc.proxy.i2p.I2P_REQUESTS_PROXY (in module darc.proxy.i2p), 15

darc.proxy.i2p.I2P_RETRY (in module darc.proxy.i2p), 15

darc.proxy.i2p.I2P_SELENIUM_PROXY (in module darc.proxy.i2p), 15

darc.proxy.irc.LOCK (built-in variable), 16

darc.proxy.irc.PATH (built-in variable), 16

darc.proxy.LINK_MAP (in module darc.proxy), 20

darc.proxy.magnet.LOCK (built-in variable), 16

darc.proxy.magnet.PATH (built-in variable), 16

darc.proxy.mail.LOCK (built-in variable), 16

darc.proxy.mail.PATH (built-in variable), 16

darc.proxy.null.LOCK (built-in variable), 16

darc.proxy.null.PATH (built-in variable), 16

darc.proxy.script.LOCK (built-in variable), 17

darc.proxy.script.PATH (built-in variable), 17

darc.proxy.tel.LOCK (built-in variable), 17

darc.proxy.tel.PATH (built-in variable), 17

darc.proxy.tor._MNG_TOR (built-in variable), 18

darc.proxy.tor._TOR_BS_FLAG (built-in variable), 18

darc.proxy.tor._TOR_CONFIG (built-in variable), 18

darc.proxy.tor._TOR_CTRL (built-in variable), 18

darc.proxy.tor._TOR_PROC (built-in variable), 18

darc.proxy.tor.BS_WAIT (built-in variable), 18

darc.proxy.tor.TOR_CFG (built-in variable), 18

darc.proxy.tor.TOR_CTRL (built-in variable), 17

darc.proxy.tor.TOR_PASS (built-in variable), 18

darc.proxy.tor.TOR_PORT (built-in variable), 17

darc.proxy.tor.TOR_REQUESTS_PROXY (built-in variable), 17

darc.proxy.tor.TOR_RETRY (built-in variable), 18

darc.proxy.tor.TOR_SELENIUM_PROXY (built-in variable), 17

darc.proxy.zeronet._MNG_ZERONET (built-in variable), 19

darc.proxy.zeronet._ZERONET_ARGS (built-in variable), 19

darc.proxy.zeronet._ZERONET_BS_FLAG (built-in variable), 19

darc.proxy.zeronet._ZERONET_PROC (built-in variable), 19

darc.proxy.zeronet.BS_WAIT (built-in variable), 19

darc.proxy.zeronet.ZERONET_ARGS (built-in variable), 19

darc.proxy.zeronet.ZERONET_PATH (built-in variable), 19

darc.proxy.zeronet.ZERONET_PORT (built-in variable), 19

darc.proxy.zeronet.ZERONET_RETRY (built-in variable), 19

darc.save._SAVE_LOCK (built-in variable), 6

darc.sites
module, 20

darc.submit.API_NEW_HOST (built-in variable), 11

darc.submit.API_REQUESTS (built-in variable), 11

darc.submit.API_RETRY (built-in variable), 11

darc.submit.API_SELENIUM (built-in variable), 11

darc.submit.PATH_API (built-in variable), 10

DARC_BULK_SIZE, 9

DARC_CHECK, 22

DARC_CHECK_CONTENT_TYPE, 22

DARC_CPU, 23

DARC_DEBUG, 22

DARC_FORCE, 22

DARC_LOCK_TIMEOUT, 10

DARC_MAX_POOL, 10

DARC_MULTIPROCESSING, 23

DARC_MULTITHREADING, 23

DARC_REBOOT, 22, 38
 DARC_REDIS_LOCK, 10
 DARC_REDIS_RETRY, 10
 DARC_SAVE, 60
 DARC_SAVE_REQUESTS, 60
 DARC_SAVE_SELENIUM, 60
 DARC_USER, 23
 DARC_VERBOSE, 22
 DARC_WAIT, 24
 drop_hostname() (in module darc.db), 7
 drop_requests() (in module darc.db), 7
 drop_selenium() (in module darc.db), 7

E

environment variable

API_NEW_HOST, 63
 API_REQUESTS, 63
 API_RETRY, 63
 API_SELENIUM, 63
 DARC_BULK_SIZE, 9, 59
 DARC_CHECK, 22, 57
 DARC_CHECK_CONTENT_TYPE, 22, 57
 DARC_CPU, 23, 58
 DARC_DEBUG, 22, 57
 DARC_FORCE, 22, 57
 DARC_FREENET, 66
 DARC_I2P, 64
 DARC_LOCK_TIMEOUT, 10
 DARC_MAX_POOL, 10, 59
 DARC_MULTIPROCESSING, 23, 58
 DARC_MULTITHREADING, 23, 58
 DARC_REBOOT, 22, 38, 57
 DARC_REDIS_LOCK, 10
 DARC_REDIS_RETRY, 10
 DARC_SAVE, 60
 DARC_SAVE_REQUESTS, 60
 DARC_SAVE_SELENIUM, 60
 DARC_TOR, 63
 DARC_USER, 23, 58
 DARC_VERBOSE, 22, 57
 DARC_WAIT, 24, 60
 DARC_ZERONET, 65
 FREENET_ARGS, 66
 FREENET_PATH, 66
 FREENET_PORT, 66
 FREENET_RETRY, 66
 FREENET_WAIT, 66
 I2P_ARGS, 65
 I2P_PORT, 64
 I2P_RETRY, 64
 I2P_WAIT, 65
 LINK_BLACK_LIST, 25, 61
 LINK_FALLBACK, 25, 61
 LINK_WHITE_LIST, 25, 61

LOCK_TIMEOUT, 59
 MIME_BLACK_LIST, 25, 62
 MIME_FALLBACK, 26, 62
 MIME_WHITE_LIST, 25, 61
 PATH_DATA, 23, 58
 PROXY_BLACK_LIST, 26, 62
 PROXY_FALLBACK, 26, 62
 PROXY_WHITE_LIST, 26, 62
 REDIS_RETRY, 59
 REDIS_URL, 23, 58
 SE_WAIT, 25, 61
 TIME_CACHE, 24, 60
 TOR_CFG, 64
 TOR_CTRL, 63
 TOR_PASS, 63
 TOR_PORT, 63
 TOR_RETRY, 64
 TOR_WAIT, 64
 ZERONET_ARGS, 66
 ZERONET_PATH, 65
 ZERONET_PORT, 65
 ZERONET_RETRY, 65
 ZERONET_WAIT, 65

extract_links() (in module darc.parse), 5

F

fetch_hosts() (in module darc.proxy.i2p), 13
 FreenetBootstrapFailed, 27

G

get_content_type() (in module darc.parse), 5
 get_hosts() (in module darc.proxy.i2p), 13
 get_lock() (in module darc.db), 7

H

have_hostname() (in module darc.db), 8
 have_hosts() (in module darc.proxy.i2p), 14
 host (darc.link.Link attribute), 1

I

i2p_bootstrap() (in module darc.proxy.i2p), 14
 I2PBootstrapFailed, 27

L

Link (class in darc.link), 1
 LINK_BLACK_LIST, 25
 LINK_FALLBACK, 25
 LINK_WHITE_LIST, 25
 LinkNoReturn, 27
 load_requests() (in module darc.db), 8
 load_selenium() (in module darc.db), 8
 LockWarning, 27

M

`match_host()` (in module *darc.parse*), 5
`match_mime()` (in module *darc.parse*), 6
`match_proxy()` (in module *darc.parse*), 6
`MIME_BLACK_LIST`, 25
`MIME_FALLBACK`, 26
`MIME_WHITE_LIST`, 25
`module`
 darc, 1
 darc.db, 7
 darc.error, 26
 darc.link, 1
 darc.parse, 4
 darc.proxy, 11
 darc.proxy.i2p, 13
 darc.sites, 20

N

`name` (*darc.link.Link* attribute), 1

P

`parse_link()` (in module *darc.link*), 2
`PATH_DATA`, 23
`proxy` (*darc.link.Link* attribute), 2
`PROXY_BLACK_LIST`, 26
`PROXY_FALLBACK`, 26
`PROXY_WHITE_LIST`, 26

Q

`quote()` (in module *darc.link*), 3

R

`read_hosts()` (in module *darc.proxy.i2p*), 14
`redis_command()` (in module *darc.db*), 8
`REDIS_URL`, 23
`RedisCommandFailed`, 27
`render_error()` (in module *darc.error*), 27

S

`save_hosts()` (in module *darc.proxy.i2p*), 14
`save_requests()` (in module *darc.db*), 9
`save_selenium()` (in module *darc.db*), 9
`SE_WAIT`, 25
`SiteNotFoundWarning`, 27

T

`TIME_CACHE`, 24
`TorBootstrapFailed`, 27
`TorRenewFailed`, 27

U

`unquote()` (in module *darc.link*), 3
`UnsupportedLink`, 27

`UnsupportedPlatform`, 27
`UnsupportedProxy`, 27
`url` (*darc.link.Link* attribute), 2
`url_parse` (*darc.link.Link* attribute), 2
`urljoin()` (in module *darc.link*), 3
`urlparse()` (in module *darc.link*), 4

Z

`ZeroNetBootstrapFailed`, 27