
holmium.core Documentation

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CHAPTER 1

Introduction

holmium.core provides utilities for simplifying the creation and maintenance of tests that rely on [Selenium](#).

Nothing beats an example. Conventionally automated tests integrating with python-selenium are written similarly to the following code block (using seleniumhq.org).

```
import selenium.webdriver
import unittest

class SeleniumHQTest(unittest.TestCase):
    def setUp(self):
        self.driver = selenium.webdriver.Firefox()
        self.url = "http://seleniumhq.org"

    def test_header_links(self):
        self.driver.get(self.url)
        elements = self.driver.find_elements_by_css_selector("div#main_navbar ul li>a
↪")

        self.assertTrue(len(elements) > 0)
        for element in elements:
            self.assertTrue(element.is_displayed())
        expected_link_list = [
            "About",
            "Blog",
            "Documentation",
            "Downloads",
            "English",
            "Projects",
            "Support",
        ]
        actual_link_list = [el.text for el in elements]
        self.assertEqual(sorted(expected_link_list), sorted(actual_link_list))

    def test_projects_selenium_heading(self):
        self.driver.get(self.url)
```

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```

        projects_link = self.driver.find_element_by_css_selector(
            "nav>a[href='./projects']"
        )
        projects_link.click()
        heading = self.driver.find_element_by_css_selector("p.lead")
        self.assertEqual(heading.text, "Selenium has many projects that combine to_
↪form a versatile testing system.")

    def tearDown(self):
        if self.driver:
            self.driver.quit()

if __name__ == "__main__":
    unittest.main()

```

The above example does what most selenium tests do:

- initialize a webdriver upon setUp
- query for one or more web elements using either class name, id, css_selector or xpath
- assert on the number of occurrences / value of certain elements.
- tear down the webdriver after each test case

It suffers from the typical web development problem of coupling the test case with the HTML plumbing of the page its testing rather than the functionality its meant to exercise. The concept of [PageObjects](#) reduces this coupling and allow for test authors to separate the layout of the page under test and the functional behavior being tested. This separation also results in more maintainable test code (*i.e. if an element name changes - all tests don't have to be updated, just the PageObject*).

Lets take the above test case for a spin with holmium. Take note of the following:

- The initialization and reset of the webdriver is delegated to the TestCase base class (*alternatively the class could subclass unittest.TestCase and be run with the holmium nose plugin*).
- the page elements are accessed in the test only via Element & ElementMap.

```

import unittest

from holmium.core import Element, ElementMap, Locators, Page, TestCase

class SeleniumHQPage(Page):
    nav_links = ElementMap(Locators.CSS_SELECTOR, "div#main_navbar ul li>a")
    header_text = Element(Locators.CSS_SELECTOR, "p.lead")

class SeleniumHQTest(TestCase):
    def setUp(self):
        self.page = SeleniumHQPage(self.driver, "http://seleniumhq.org")

    def test_header_links(self):
        self.assertTrue(len(self.page.nav_links) > 0)
        self.assertElementsDisplayed(self.page.nav_links)
        self.assertEqual(
            sorted(
                [

```

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```
        "About",
        "Blog",
        "Documentation",
        "Downloads",
        "English",
        "Projects",
        "Support",
    ],
    sorted(self.page.nav_links.keys()),
)

def test_projects_selenium_heading(self):
    self.page.nav_links["Projects"].click()
    self.assertEqual(
        self.page.header_text,
        "Selenium has many projects that combine to form a versatile_
↪testing system.",
    )

if __name__ == "__main__":
    unittest.main()
```

Which can then be executed in a few different ways as shown below.

```
HO_BROWSER=firefox python test_selenium_hq.py
```

Feature Summary

- Automatic provisioning and configuration of webdriver instances based on environment variables
- Shorthand assertions for web pages ([TestCase](#))
- Declarative model for defining pages, sections, page elements and element collections ([Page Objects](#))

2.1 Building PageObjects

2.1.1 Overview

A typical PageObject built with `holmium.core` has the following composition:

- **Page**
 - *Element*
 - *Elements*
 - *ElementMap*
 - **Section**
 - * *Element*
 - * *Elements*
 - * *ElementMap*
 - **Sections**
 - * *Element*
 - * *Elements*
 - * *ElementMap*

A Page is initialized with a `selenium.webdriver.remote.webdriver.WebDriver` instance and can take some optional arguments.

```
class MyPage(Page):
    pass

driver = selenium.webdriver.Firefox()
p = MyPage(driver)
p = MyPage(driver, url = "http://www.google.com")
p = MyPage(driver, url = "http://www.google.com", iframe = "#frame")
```

Providing the `url` argument will result in the driver navigating to the `url` when the `Page` is initialized. The `iframe` argument forces an invocation of `selenium.webdriver.remote.webdriver.WebDriver.switch_to_frame()` everytime an element in the `Page` is accessed.

The `webdriver` that is supplied to a `Page` is used when looking up any `Element`, `Elements` or `ElementMap` that is declared as a static member.

To understand the wiring between a `Page` and its elements try out the example below in a python repl.

```
from holmium.core import Page, Element, Elements, ElementMap, Locators
import selenium.webdriver
driver = selenium.webdriver.Firefox()
class GooglePage(Page):
    search_box = Element(Locators.NAME, "q", timeout = 1)
    google_footer = ElementMap(Locators.CSS_SELECTOR, "#fsl>a", timeout = 1)

g = GooglePage(driver, url="http://www.google.ca")
g.search_box
# <selenium.webdriver.remote.webelement.WebElement object at 0x10b50e450>
g.google_footer
# OrderedDict([(u'Advertising', <selenium.webdriver.remote.webelement.WebElement_
↪object at 0x10b35f250>), ....
g.google_footer["About"]
# <selenium.webdriver.remote.webelement.WebElement object at 0x10b35f450>
g.google_footer["About"].get_attribute("href")
# u'http://www.google.ca/intl/en/about.html?fg=1'
driver.get("http://www.google.co.tz")
g.google_footer["Kuhusu Google"].get_attribute("href")
# u'https://www.google.co.tz/intl/sw/about.html?fg=1'
```

Both the element `search_box` and the collection of footer links `google_footer` are looked up using the driver that was passed into the `GooglePage` instance.

2.1.2 Sections

`Section` objects can be used to further encapsulate blocks of page logic that may either be reusable between different pages or accessed from within different parts of the page in a similar manner. Examples of such usecases are menus, footers and collections that may not follow a standard list or map formation.

Take for example a page with the following structure.

```
from holmium.core import Page, Section, Element, Elements, ElementMap, Locators
import selenium.webdriver

headlines_snippet = """
<html>
    <body>
        <div class='header'>
```

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```

        <h1>Headlines</h1>
        <h2>Breaking news!!</h2>
    </div>
    <div class='news_section'>
        <ul>
            <li>
                <div class='heading'>Big News!!!</div>
                <div class='content'>Just kidding</div>
            </li>
            <li>
                <div class='heading'>Other Big News!!!</div>
                <div class='content'>Again, just kidding</div>
            </li>
        </ul>
    </div>
</body>
</html>"""
sports_snippet = """
<html>
    <body>
        <div class='header'>
            <h1>Sports news</h1>
            <h2>Breaking news!!</h2>
        </div>
        <table class="events">
            <tr>
                <td class='sport'>Soccer</td>
                <td class='status'>World cup</td>
            </tr>
            <tr>
                <td class='sport'>Cricket</td>
                <td class='status'>League matches</td>
            </tr>
        </table>
        <div class='news_section'>
            <ul>
                <li>
                    <div class='heading'>Soccer worldcup finals!!!</div>
                    <div class='content'>I'm running out of meaningful snippets</div>
                </li>
                <li>
                    <div class='heading'>Cricket league matches</div>
                    <div class='content'>I'm definitely out.</div>
                </li>
            </ul>
        </div>
    </body>
</html>"""

class Heading(Section):
    main = Element( Locators.CSS_SELECTOR, "h1")
    sub = Element( Locators.CSS_SELECTOR, "h2")

class NewsSection(Section):
    articles = ElementMap( Locators.CSS_SELECTOR, "ul>li"
                           , key=lambda el: el.find_element_by_class_name('heading').
→text

```

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```

        , value=lambda el: el.find_element_by_class_name('content
↪').text
    )

class SportsEventsSection(Section):
    events = ElementMap( Locators.CSS_SELECTOR, "tr"
        , key=lambda el: el.find_element_by_class_name('sport').
↪text
        , value=lambda el: el.find_element_by_class_name('status
↪').text
    )

class NewsPage(Page):
    heading = Heading(Locators.CLASS_NAME, "header")
    news_section = NewsSection(Locators.CLASS_NAME, "news_section")

class HeadlinePage(NewsPage):
    pass

class SportsPage(NewsPage):
    sports_events = SportsEventsSection(Locators.CLASS_NAME, "events")

driver = selenium.webdriver.Firefox()
open("/var/tmp/headlines.html", "w").write(headlines_snippet)
open("/var/tmp/sports.html", "w").write(sports_snippet)

headlines = HeadlinePage(driver, "file:///var/tmp/headlines.html")
print headlines.news_section.articles["Big News!!!"]
print headlines.heading.main.text

sports = SportsPage(driver, "file:///var/tmp/sports.html")
print sports.heading.main.text
print sports.news_section.articles["Soccer worldcup finals!!!"]
print sports.sports_events.events["Cricket"]

```

Though there are two different pages being accessed, they follow a similar structure and the `news_section` and `header` parts can be encapsulated into a common `Section`. Though the `events` section in the sports page isn't used anywhere else - it still makes it clearer to define it as a `Section` to separate its logic from the main `SportsPage`.

There may be other usecases where `Section` objects may be used to represent complex objects within a page that appear repeatedly in a list like manner. To reduce the duplication of specifying `Section` objects repeatedly in a `Page` a `Sections` object may be used to obtain an iterable view of all matched `Section` objects.

Warning: Though one could be inclined to treat `Sections` as any other collection please only use them as an iterable or do indexed access directly on the `Sections` object. Trying to cast a `Sections` property into a list is not supported.

```

from holmium.core import Page, Sections, Element, Elements, ElementMap, Locators
import selenium.webdriver

page_snippet = """
<html>
  <body>

```

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```

    <div class='thought'>
        <div class='author'>
            <span class='user'>John</span>
            <span class='reputation'>1000</span>
        </div>
        <div class='details'>
            <div class='brief'>John's world view</div>
            <div class='full_text'>Sleeping is important</div>
        </div>
    </div>
    <div class='thought'>
        <div class='author'>
            <span class='user'>Jane</span>
            <span class='reputation'>100000000</span>
        </div>
        <div class='details'>
            <div class='brief'>Jane's world view</div>
            <div class='full_text'>John's world view is not important...</div>
        </div>
    </div>
</body>
</html>"""

class ThoughtSections(Sections):
    author = Element(Locators.CLASS_NAME, "user")
    brief = Element(Locators.CSS_SELECTOR, "div.details div.brief")
    full_text = Element(Locators.CSS_SELECTOR, "div.details div.full_text")

class MainPage(Page):
    thoughts = ThoughtSections(Locators.CLASS_NAME, "thought")

driver = selenium.webdriver.Firefox()
open("/var/tmp/page.html", "w").write(page_snippet)

main_page = MainPage(driver, "file:///var/tmp/page.html")
for thought in main_page.thoughts:
    print thought.author.text
    print thought.brief.text
    print thought.full_text.text

```

2.1.3 Collections

To keep the interaction with collections of elements in a Page readable and logically grouped - it is useful to represent and access such elements in a page the same way as one would a python list or dictionary. The *Elements* and *ElementMap* (which is used in the previous example) can be used to organize elements with either relationship.

Using the table defined in snippet below, a Page can be constructed that allows you to access the value or title of each row either as a list or a dictionary keyed by the title.

Take note of the differences in construction of `element_values` and `element_titles`. Since `element_values` does not provide a lookup function via the value argument, the element returned is a pure `selenium.webdriver.remote.webelement.WebElement`. In the case of `element_titles` the lookup function extracts the text attribute of the element. The same type of lookup functions are used in `element_map` to create the key/value pairs.

```
snippet = """
<html>
<body>
<table>
  <tr>
    <td class='title'>title 1</td>
    <td class='value'>value one</td>
  </tr>
  <tr>
    <td class='title'>title 2</td>
    <td class='value'>value two</td>
  </tr>
</table>
</body>
</page>
"""

from holmium.core import Page, Elements, ElementMap, Locators
import selenium.webdriver

class Trivial(Page):
    element_values = Elements(Locators.CSS_SELECTOR
                              , "tr>td[class='value']" )
    element_titles = Elements(Locators.CSS_SELECTOR
                              , "tr"
                              , value=lambda el: el.find_element_by_css_selector(
→ "td[class='value']").text)
    element_map = ElementMap(Locators.CSS_SELECTOR
                              , "tr"
                              , key=lambda el: el.find_element_by_css_selector(
→ "td[class='title']").text
                              , value=lambda el: el.find_element_by_css_selector(
→ "td[class='value']").text)

driver = selenium.webdriver.Firefox()
t = Trivial(driver)
open("/var/tmp/test.html", "w").write(snippet)
driver.get("file:///var/tmp/test.html")
t.element_values[0].text
# u'one'
t.element_titles[0]
# u'1'
t.element_map.keys()
# [u'1', u'2']
t.element_map["1"]
# u'one'
```

2.1.4 Conditions

Changes to the dom, such as element visibility and content, are expected for any non-trivial web page. Page elements *Element*, *Elements*, and *ElementMap* accept a keyword argument *filter_by*: a callable that expects a *selenium.webdriver.remote.webelement.WebElement* and is expected to return *True/False*. In *Elements* and *ElementMap*, only elements that meet the *filter_by* condition will be included in the collection. If the *filter_by* condition is not met in *Element*, *None* will be returned. Some common conditions are provided:

```
class holmium.core.conditions.VISIBLE
```

checks if the element is visible

```
class holmium.core.conditions.INVISIBLE
```

checks if the element is invisible

```
class holmium.core.conditions.MATCHES_TEXT(expr)
```

checks if the element's text matches the provided regular expression.

These conditions can also be used to place explicit waits on elements expected to change asynchronously by pairing the `only_if` keyword argument with `timeout`. In *Element*, `only_if` is also a callable that expects a `selenium.webdriver.remote.webelement.WebElement` and is expected to return `True/False`.

2.1.4.1 Sample

```
from holmium.core import conditions, Page, Element, Locators

class MyPage(Page):
    required_element = Element(Locators.CLASS_NAME, "main_element",
                              only_if=conditions.VISIBLE(),
                              timeout = 5)
    delayed_element = Element(Locators.CLASS_NAME, "text_element",
                              only_if=conditions.MATCHES_TEXT('^ready.*'),
                              timeout = 5)
```

In the above example, `required_element` will return `None` unless it is displayed. The 5 second timeout will take effect every time the element is accessed. Similarly, `delayed_element` will return `None` until the text of the element matches a string that starts with `ready`.

`only_if` and `timeout` explicit waits can also be used with *Elements* and *ElementMap*. In these element collections, `only_if` expects a list of `selenium.webdriver.remote.webelement.WebElement` items and is also expected to return `True/False`. These common conditions for use with element collections are provided:

```
class holmium.core.conditions.ANY(condition)
```

checks if any of the elements in the collection match the condition.

```
class holmium.core.conditions.ALL(condition)
```

checks if all of the elements in the collection match the condition.

You can build your own condition objects by subclassing `conditions.BaseCondition` and implementing the `conditions.BaseCondition.evaluate()` method.

2.1.4.2 Context Managers

Conditions can also be used as context managers in cases where condition parameters are not known at page object declaration time. For example:

```
from holmium.core import Page, ElementMap
from holmium.core.conditions import ANY, MATCHES_TEXT

class MyPage(Page):
    dynamic_element_collection = ElementMap(Locators.CLASS_NAME, "dynamic", timeout = 5)

    def get_element(self, name):
```

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```
with ANY (MATCHES_TEXT(name)) :  
    return self.dynamic_element_collection[name]
```

2.1.5 Page Facets

Beyond elements maintained by a page, there are other characteristics that can define the behavior of a Page or Section. Holmium allows you to decorate a page with a `facets.Facet` which ensures evaluation of the facet before the first access on the Page or Section.

2.1.5.1 Builtin facets

class `holmium.core.facets.Title` (*required=True, debug=False, **kwargs*)
enforces the title of the current page.

Parameters

- **title** (*str*) – a regular expression to match the title.
- **debug** (*bool*) – if True a failure to evaluate will not result in an exception, only a log warning
- **required** (*bool*) – if False a failure to evaluate will be treated as a noop.

class `holmium.core.facets.Cookie` (*required=True, debug=False, **kwargs*)
enforces the existence (and optionally the value) of a cookie.

Parameters

- **name** (*str*) – name of the cookie
- **value** (*dict*) – (optional) dict (or callable) to validate the value of the cookie.
- **debug** (*bool*) – if True a failure to evaluate will not result in an exception, only a log warning
- **required** (*bool*) – if False a failure to evaluate will be treated as a noop.

class `holmium.core.facets.Strict` (*required=True, debug=False, **kwargs*)
enforces that every element declared in the Page or Section be present.

Parameters

- **debug** (*bool*) – if True a failure to evaluate will not result in an exception, only a log warning
- **required** (*bool*) – if False a failure to evaluate will be treated as a noop.

class `holmium.core.facets.Defer` (*required=True, debug=False, **kwargs*)

Parameters

- **page** (`holmium.core.Page`) – the page object that is expected to be deferred to
- **action** (*function*) – a callable that takes the page object instance as the first argument
- **action_arguments** (*dict*) – (optional) dictionary of arguments to pass to *action*
- **debug** (*bool*) – if True a failure to evaluate will not result in an exception, only a log warning
- **required** (*bool*) – if False a failure to evaluate will be treated as a noop.

For good measure, lowercased aliases are available for builtin facets:

```
holmium.core.facets.title
    alias of holmium.core.facets.Title

holmium.core.facets.strict
    alias of holmium.core.facets.Strict

holmium.core.facets.cookie
    alias of holmium.core.facets.Cookie

holmium.core.facets.defer
    alias of holmium.core.facets.Defer
```

2.1.5.2 Rolling your own

You can create your own facet decorator by subclassing *facets.Facet* and implementing the *facets.Facet.evaluate()* method. Any additional arguments that you want to access during evaluation should be declared as the following class members:

- required arguments as an `__ARGS__` list
- optional arguments as an `__OPTIONS__` dictionary.

You can also declare an `__ALLOW_MULTIPLE__` property on your facet which will control the expectation from multiple decorations of the same facet type. If set to `False` the last facet decorator applied will be respected (for example as with the *facets.title* facet - for which it only makes sense to respect the last decorator applied).

The example facet below would require that *color* as an argument, and would optionally accept *image*. When the facet is evaluated it would assert on the *background-color* of the body element and optionally, the *background-image*.

```
class background(Facet):
    __ARGS__ = ["color"]
    __OPTIONS__ = {"image": None}
    def validate(self, driver):
        body = driver.find_element_by_tag_name("body")
        assert_equals( self.arguments["color"], body.value_of_css_property(
↪ "background-color")
        if self.options["image"]:
            assert_equals( self.options["image"], body.value_of_css_property(
↪ "background-image")
```

The decorator could then be applied as follows

```
@background(color="rgb(255, 255, 255)", image="none")
class Google(Page):
    google_button = Element(Locators.NAME, "btnK")
```

Additionally individual *Element*, *ElementMap* or *Elements* members of a *Page* or *Section* can be promoted to a facet by adding the *facet=True* keyword argument. This will ensure that the specified element is **required** at the time of the containers first access.

2.1.5.3 Sample

```
from holmium.core import facets, Page, Element, Section, Locators

class MySection(Section):
```

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```
required_element = Element(Locators.CLASS_NAME, "main_element", facet=True)
optional_element = Element(Locators.CLASS_NAME, "secondary_element")

@facets.title(title='login page')
class LoginPage(Page):
    def do_login(self, username, password):
        ....

@facets.cookie(name="session")
@facets.defer(page=LoginPage, action=LoginPage.do_login, action_arguments= {"username": "ali", "password": "sekret"})
class ContentPage(Page):
    section = MySection(Locators.ID, "main-section")
```

To understand how the facets are evaluated, consider the following code path

```
from selenium import webdriver

driver = webdriver.Firefox()

p = ContentPage(driver, "http://localhost/content")
assert p.section.optional_element != None
```

The chain of execution when calling `p.section.required_element` is as follows

- check defer to *LoginPage*
- check *title* of *LoginPage*
- perform *do_login*
- check *cookie* of *ContentPage*
- check *required* element exists in *MySection*
- return *optional_element*

2.1.6 Customizing page elements

To further customize domain / page specific behaviors of certain web elements, the *ElementEnhancer* base class can be extended to hijack `selenium.webdriver.remote.webelement.WebElement`. The located web element is made available to the subclass as `self.element`.

In the sample below, the *SelectEnhancer* enhancer will be used to hijack any web element that has the tag name *select*. All properties and methods exposed by the `selenium.webdriver.remote.webelement.WebElement` object will still be accessible, and extra methods/properties (such as ‘options’) will be added on. You can register your own *ElementEnhancer* via a call to `register_enhancer()` and subsequently reset them via a call to `reset_enhancers()`.

By default, holmium only installs a *SelectEnhancer* that shadows `selenium.webdriver.support.select.Select`.

```
class SelectEnhancer(ElementEnhancer):
    __TAG__ = "select"
    @property
    def options(self):
        return self.element.find_elements_by_tag_name("option")
```

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```

def has_option(self, option_name):
    return any([k.text == option_name for k in self.options])

holmium.core.register_enhancer(SelectEnhancer)

```

2.1.7 More Examples

2.1.7.1 google search

```

import unittest

import selenium.webdriver

from holmium.core import Element, Elements, Locators, Page

class GoogleMain(Page):
    search_box = Element(Locators.NAME, "q", timeout=2)
    search_results = Elements(
        Locators.CSS_SELECTOR,
        "div.rc",
        timeout=2,
        value=lambda el: {
            "link": el.find_element_by_css_selector("div.r>a").get_attribute("href"),
            "title": el.find_element_by_css_selector("div.r>a>h3").text,
        },
    )

    def search(self, query):
        self.search_box.clear()
        self.search_box.send_keys(query)
        self.search_box.submit()

class TextSearchTest(unittest.TestCase):
    def setUp(self):
        self.driver = selenium.webdriver.Firefox()
        self.page = GoogleMain(self.driver, "http://www.google.com")

    def test_text_search(self):
        self.assertTrue(len(self.page.search("selenium testing").search_results) > 0)

    def test_text_search_first_result(self):
        # execute the page object method search
        self.page.search("selenium testing")
        self.assertEqual(self.page.search_results[0]["title"], "Selenium")
        self.assertEqual(
            self.page.search_results[0]["link"], "https://www.selenium.dev/"
        )

    def tearDown(self):
        self.driver.quit()

```

2.1.7.2 Wikipedia text search example

```
import unittest

import selenium.webdriver
from selenium.webdriver.common.by import By

from holmium.core import Element, ElementMap, Locators, Page
from holmium.core.conditions import VISIBLE

class WikiPedia(Page):
    languages = ElementMap(
        Locators.CLASS_NAME,
        "central-featured-lang",
        key=lambda el: el.get_attribute("lang"),
        value=lambda el: el.find_element(By.TAG_NAME, "a"),
    )
    search_box = Element(Locators.CSS_SELECTOR, "input#searchInput")
    article_title = Element(
        Locators.CSS_SELECTOR, "h1#firstHeading", only_if=VISIBLE(), timeout=5
    )
    search_results = ElementMap(Locators.CSS_SELECTOR, "div.mw-search-result-heading>a")

    def search(self, query):
        self.search_box.clear()
        self.search_box.send_keys(query)
        self.search_box.submit()

class TextSearchArticle(unittest.TestCase):
    def setUp(self):
        self.driver = selenium.webdriver.Firefox()
        self.page = WikiPedia(self.driver, "http://wikipedia.org")

    def test_text_search_alllangs(self):
        for language in self.page.languages:
            self.page.go_home().languages[language].click()
            self.assertTrue(
                self.page.search("google").article_title.text.startswith("Google"),
                language,
            )

    def tearDown(self):
        self.driver.quit()
```

2.2 Unit Test Integration

Holmium provides two utilities to ease integration with automated tests.

2.2.1 The TestCase base class

This base class extends `unittest.TestCase` and adds the following functionality:

- automatically provision any number of selenium webdrivers (`driver/drivers`) to the testcase based on the environment variable `HO_BROWSER`. The webdrivers are generated lazily upon access of the `driver` or `drivers` attributes.
- A remote selenium server can also be used by setting the value of `HO_REMOTE` to the fully qualified url to the selenium server (e.g. <http://localhost:4444/wd/hub>)
- clears the browser cookies between each test case
- quits the driver(s) at the end of the test class or at the end of the test run (depending on the configuration).
- extra assertion methods relevant to `selenium.webdriver.remote.webelement.WebElement` (refer to `TestCase`)

The following environment variables are respected by `TestCase` when `unittest.TestCase.setUpClass()` is executed.

2.2.1.1 Environment Variables

variable	description
<code>HO_BROWSER</code>	one of chrome,firefox,opera,safari, ie,phantomjs,android,iphone or ipad
<code>HO_REMOTE</code>	the full qualified url of the selenium server. If not provided the browsers will be attempted to be launched using the built in webdrivers.
<code>HO_USERAGENT</code>	useragent to use as an override. only works with firefox & chrome
<code>HO_IGNORE_SSL_ERRORS</code>	Ignore ssl errors when accessing pages served under untrusted certificates (default False).
<code>HO_BROWSER_PER_TEST</code>	If the variable is set the browser is created/destroyed for each test class (default False).

2.2.1.2 Example test case

```
import unittest
import holmium.core

class SimpleTest(holmium.core.TestCase):
    def setUp(self):
        self.driver.get("http://www.google.com")

    def test_title(self):
        self.assertEqual(self.driver.title, "Google")

if __name__ == "__main__":
    unittest.main()
```

2.2.1.3 Execution

```
# against the builtin firefox driver
HO_BROWSER=firefox python test_simple.py
# against a firefox instance under a remote selenium server
HO_BROWSER=firefox HO_REMOTE=http://localhost:5555/wd/hub python test_simple.py
```

2.3 Holmium API documentation

2.3.1 Public classes

2.3.1.1 Page Objects & Friends

class `holmium.core.Page` (*driver, url=None, iframe=None*)

Base class for all page objects to extend from. void Instance methods implemented by subclasses are provisioned with fluent wrappers to facilitate with writing code such as:

```
class Google(Page):
    def query(self):
        ....

    def submit(self):
        ....

    def get_results(self):
        ....

assert len(Google().query("page objects").submit().get_results()) > 0
```

class `holmium.core.Section` (*locator_type, query_string, iframe=None, timeout=0*)

Base class to encapsulate reusable page sections:

```
class MySection(Section):
    things = Elements( .... )

class MyPage(Page):
    section_1 = MySection(Locators.CLASS_NAME, "section")
    section_2 = MySection(Locators.ID, "unique_section")
```

class `holmium.core.Sections` (*locator_type, query_string, iframe=None, timeout=0*)

Base class for an Iterable view of a collection of `holmium.core.Section` objects.

class `holmium.core.Element` (*locator_type, query_string, base_element=None, timeout=0, value=<function ElementGetter.<lambda>>, only_if=<function ElementGetter.<lambda>>, facet=False, filter_by=<function ElementGetter.<lambda>>*)

Utility to get a `selenium.webdriver.remote.webelement.WebElement` by querying via one of `holmium.core.Locators`

Parameters

- **locator_type** (`holmium.core.Locators`) – selenium locator to use when locating the element
- **query_string** (*str*) – the value to pass to the locator
- **base_element** (`holmium.core.Element`) – a reference to another element under which to locate this element.
- **timeout** (*int*) – time to implicitly wait for the element
- **value** (*lambda*) – transform function for the value of the element. The located `selenium.webdriver.remote.webelement.WebElement` instance is passed as the only argument to the function.

- **only_if** (*function*) – extra validation function that is called repeatedly until `timeout` elapses. If not provided the default function used checks that the element is present. The located `selenium.webdriver.remote.webelement.WebElement` instance is passed as the only argument to the function.
- **facet** (*bool*) – flag to treat this element as a facet.
- **filter_by** (*function*) – condition function that determines if the located `selenium.webdriver.remote.webelement.WebElement`, the only argument passed to the function, should be returned. If not provided, the default function used checks that the element is present.

```
class holmium.core.Elements(locator_type, query_string=None, base_element=None, time-
                           out=0, value=<function Elements.<lambda>>, only_if=<function
                           Elements.<lambda>>, facet=False, filter_by=<function Ele-
                           ments.<lambda>>)
```

Utility to get a collection of `selenium.webdriver.remote.webelement.WebElement` objects by querying via one of `holmium.core.Locators`

Parameters

- **locator_type** (`holmium.core.Locators`) – selenium locator to use when locating the element
- **query_string** (*str*) – the value to pass to the locator
- **base_element** (`holmium.core.Element`) – a reference to another element under which to locate this element.
- **timeout** (*int*) – time to implicitly wait for the element
- **value** (*lambda*) – transform function for each element in the collection. The located `selenium.webdriver.remote.webelement.WebElement` instance is passed as the only argument to the function.
- **only_if** (*function*) – extra validation function that is called repeatedly until `timeout` elapses. If not provided the default function used checks that the element collection is not empty. The list of located `selenium.webdriver.remote.webelement.WebElement` instances is passed as the only argument to the function.
- **facet** (*bool*) – flag to treat this element as a facet.
- **filter_by** (*function*) – condition function determines which elements are included in the collection. If not provided the default function used includes all elements identified by `query_string`. A `selenium.webdriver.remote.webelement.WebElement` instance is passed as the only argument to the function.

```
class holmium.core.ElementMap(locator_type, query_string=None, base_element=None,
                             timeout=0, key=<function ElementMap.<lambda>>,
                             value=<function ElementMap.<lambda>>, only_if=<function
                             ElementMap.<lambda>>, facet=False, filter_by=<function
                             ElementMap.<lambda>>)
```

Used to create dynamic dictionaries based on an element locator specified by one of `holmium.core.Locators`.

The wrapped dictionary is an `collections.OrderedDict` instance.

Parameters

- **locator_type** (`holmium.core.Locators`) – selenium locator to use when locating the element
- **query_string** (*str*) – the value to pass to the locator

- **base_element** (`holmium.core.Element`) – a reference to another element under which to locate this element.
- **timeout** (`int`) – time to implicitly wait for the element
- **facet** (`bool`) – flag to treat this element as a facet.
- **key** (`lambda`) – transform function for mapping a key to a `WebElement` in the collection. The located `selenium.webdriver.remote.webelement.WebElement` instance is passed as the only argument to the function.
- **value** (`lambda`) – transform function for the value when accessed via the key. The located `selenium.webdriver.remote.webelement.WebElement` instance is passed as the only argument to the function.
- **only_if** (`function`) – extra validation function that is called repeatedly until `timeout` elapses. If not provided the default function used checks that the element collection is not empty. The list of located `selenium.webdriver.remote.webelement.WebElement` instances is passed as the only argument to the function.
- **filter_by** (`function`) – condition function determines which elements are included in the collection. If not provided the default function used includes all elements identified by `query_string`. A `selenium.webdriver.remote.webelement.WebElement` instance is passed as the only argument to the function.

```
class holmium.core.Locators
    proxy class to access locator types

    CLASS_NAME = 'class name'
    CSS_SELECTOR = 'css selector'
    ID = 'id'
    LINK_TEXT = 'link text'
    NAME = 'name'
    PARTIAL_LINK_TEXT = 'partial link text'
    TAG_NAME = 'tag name'
    XPATH = 'xpath'
```

2.3.1.2 Utilities

```
class holmium.core.TestCase (methodName='runTest')
    Base class for creating test classes for writing holmium driven test cases. More details can be found at The TestCase base class
```

```
assertConditionWithWait (driver, condition, timeout=0, msg=None, ignored_exceptions=None)
    Fail if the condition specified does not hold for the element within the specified timeout
```

Parameters

- **driver** – the selenium driver
- **condition** – an instance of `selenium.webdriver.support.expected_conditions`
- **msg** – the failure message when timeout, could be a string or a callable without arguments that returns a string
- **timeout** – to be passed to `selenium.webdriver.support.wait.WebDriverWait`

• **ignored_exceptions** – to be passed to *selenium.webdriver.support.wait.WebDriverWait*

assertElementAttributeEqual (*element, key, value, msg=None*)

Fail if the element does not have the specified attribute value

assertElementCSS (*element, css_property, value, msg=None*)

Fail if the element does not exhibit the correct css property value. The value of the elements css property is the one returned by `selenium.webdriver.remote.webelement.WebElement.value_of_css_property()`

assertElementDisplayed (*element, msg=None*)

Fail if the element is not visible

assertElementSize (*element, width, height, msg=None*)

Fail if the element size does not match the provided values

assertElementTextEqual (*element, text, msg=None*)

Fail if the text attribute of the element does not match

assertElementsDisplayed (*elements, msg=None*)

Fail if any of the elements in the element collection are not visible

classmethod setUpClass ()

prepare the driver initialization based on the environment variables that have been set. The driver is not actually initialized until the test itself actually refers to it via *self.driver*.

tearDown ()

clear the cookies on the driver after each test

classmethod tearDownClass ()

quit the driver after the test run (or after all the test methods in the class have finished if `HO_BROWSER_PER_TEST` is set).

class `holmium.core.Config` (*dct, environment={'holmium': {'environment': 'development'}}*)

Dictionary like helper class for maintaining test data configurations per environment.

`holmium.core.TestCase` looks for either a config.json or config.py file in the same directory as the test file, and will make a config object available to the test case instance.

The `holmium.core.Config` object is aware of the environment and will return the config variable from that environment or from the *default* key.

Values in the config file can use `jinja2.Template` templates to access either values from itself, environment variables or a select magic holmium variables: `holmium.environment`, `holmium.browser`, `holmium.user_agent` and `holmium.remote`.

Example config structure (which uses a magic variable `holmium.environment` and an environment variable `$PATH`).

JSON

```
{
  "default": {
    "path": "{{PATH}}",
    "login_url": "{{url}}/{{holmium.environment}}/login",
    "username": "{{holmium.environment}}user"
  },
  "production": {
    "url": "http://prod.com",
    "password": "sekret"
  }
}
```

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```
},
"development": {
    "url": "http://dev.com",
    "password": "password"
}
}
```

Python

```
config = {
    {
        'default': {
            'path': "{{PATH}}",
            'login_url': '{{url}}/{{holmium.environment}}/login',
            'username' : '{{holmium.environment}}user'
        },
        'production': {
            'url': 'http://prod.com',
            'password': 'sekret'
        },
        'development': {
            'url': 'http://dev.com',
            'password': 'password'
        }
    }
}
```

When accessing `self.config` within a test, due to the default:

- `self.config['path']` will always return the value of the environment variable `PATH`,
- `self.config['password']` will always return 'sekret'

if `HO_ENV` or `--holmium-env` are production:

- `self.config['username']` will return `productionuser`
- `self.config['password']` will return `sekret`
- `self.config['login_url']` will return `http://prod.com/production/login`

if `HO_ENV` or `--holmium-env` are development:

- `self.config['username']` will return `developmentuser`
- `self.config['password']` will return `password`
- `self.config['login_url']` will return `http://dev.com/development/login`

class `holmium.core.ElementEnhancer` (*element*)

base class for implementing custom element enhancers to add functionality to located webelements based on the element type (tag name)

classmethod `matches` (*element*)

class method to verify that this enhancer is appropriate for the provided webelement

`holmium.core.register_enhancer` (*enhancer*)

registers a *ElementEnhancer* with the internal lookup

`holmium.core.reset_enhancers` ()

resets the state so that any *ElementEnhancer* that was registered via a call to *register_enhancer* () is removed.

2.3.2 Internal Classes

2.3.2.1 Page Object Helpers

class holmium.core.pageobject.**ElementDict** (*instance, *args, **kwargs*)
 proxy to a standard dict which would be stored in a *holmium.core.Page*.

items () → a set-like object providing a view on D's items

values () → an object providing a view on D's values

class holmium.core.pageobject.**ElementList** (*instance, *args, **kwargs*)
 proxy to a standard list which would be stored in a *holmium.core.Page*.

class holmium.core.pageobject.**ElementGetter** (*locator_type,* *query_string,*
base_element=None, *timeout=0,*
value=<function ElementGet-
ter.<lambda>>, only_if=<function El-
ementGetter.<lambda>>, facet=False,
filter_by=<function ElementGet-
ter.<lambda>>)

internal class to encapsulate the logic used by *holmium.core.Element* & *holmium.core.Elements*

classmethod **enhance** (*element*)

incase a higher level abstraction for a WebElement is available we will use that in Pages. (e.g. a select element is converted into *selenium.webdriver.support.ui.Select*)

root

returns the root webelement

class holmium.core.facets.**FacetCollection** (**a*)
 utility collection class for pageobjects to encapsulate facets

append (*item*)

overridden add method to pop the last item if its type does not support multiple facets on the same object.

evaluate_all (*driver*)

iterate over all registered *Facet* objects and validate them

Parameters **driver** (*selenium.webdriver.remote.webdriver.WebDriver*) –
 the webdriver

type_map

view on the list to help with figuring out if a facet of the same type already exists

class holmium.core.facets.**Facet** (*required=True, debug=False, **kwargs*)
 base class to implement an attribute of a page

evaluate (*driver*)

evaluate whether this facet holds true. Raise an Exception if not.

Parameters **driver** (*selenium.webdriver.remote.webdriver.WebDriver*) –
 the webdriver

get_name ()

returns the class name of the facet

get_parent_name ()

returns the class name of the parent

parent_class

returns the parent class

register (*obj*)

registers a *Facet* on an object

Parameters *obj* (`holmium.core.facets.Faceted`) – the object to register the facet on.

class `holmium.core.facets.Faceted`

mixin for objects that want to have facets registered on them.

evaluate ()

evaluates all registered facets (class & instance)

classmethod `get_class_facets` ()

returns the facets registered on the class (presumably via a decorator)

get_instance_facets ()

returns the facets registered on the instance

exception `holmium.core.facets.FacetError` (*facet, exc=None*)

exception raised when a facet has an error or can't complete

Parameters

- **facet** (`holmium.core.facets.Facet`) – the facet that failed to evaluate
- **exc** (`exceptions.Exception`) – the inner exception that caused the failure

class `holmium.core.conditions.BaseCondition`

base class to implement conditions passed to the `only_if` parameter of `holmium.core.pageobject.ElementGetter` subclasses.

evaluate (*element*)

abstract method to be implemented by derived classes.

2.3.2.2 Test configuration / execution

class `holmium.core.config.HolmiumConfig` (*browser, remote, capabilities, user_agent, environment, ignore_ssl, fresh_instance*)

utility class for storing holmium configuration options strictly. The class behaves like a dictionary after construction with the additional behavior that any attributes set on it are available as keys in the dictionary and vice versa.

2.4 Development

2.4.1 Contributors

- [Sajnikanth Suriyanarayanan](#), Testing and initial integration and evaluation.
- *Wilsen Davil*, original Holmium logo
- *Alejandro Perez*, Section(s) design.
- *Johan Gozali*, Evaluation and help designing Facets
- [Nathan Jones](#), Bug fixes
- [Lata Suresh](#), Bug fixes
- [Jeffry Pincus](#), *filter_by* conditions
- [Chow Loong Jin](#), Bug Fixes

2.4.2 Project Resources

Continuous Integration The project is being continuously built using [github actions](#) against python 2.7, 3.5, 3.7 & 3.8

Code The code is hosted on [github](#).

Bugs, Feature Requests Tracked at the [issue tracker](#).

2.4.3 Installation

Note: Holmium is tested and supported on pythons version 2.7 & 3.5+.

The stable version can be installed either via `pip` or `easy_install`.

```
pip install holmium.core
# or
easy_install holmium.core
```

To use `holmium.core` directly from source the preferred method is to use the `develop` mode. This will make `holmium.core` available on your *PATH*, but will point to the checkout. Any updates made in the checkout will be available in the *installed* version.

```
git clone git@github.com:alisaifee/holmium.core
cd holmium.core
sudo python setup.py develop
```

2.4.4 Tests

`holmium.core` uses `nosetests` for running its tests. You will also need `chromedriver` installed to run certain tests that make more sense without mocking. For instructions on installing `chromedriver` go to the [chromedriver](#) page.

```
cd holmium.core
nosetests --with-coverage --cover-html --cover-erase --cover-package=holmium.core
```

2.5 Changelog

2.5.1 v1.1.0

Release Date: 2023-02-28

- Chores
 - Remove dependency on `six` & `ordereddict`
 - Upgrade syntax to python 3.7+
 - Automate pypi release process

2.5.2 v1.0.0

Release Date: 2023-02-27

- Breaking Changes
 - Remove support for python < 3
 - Remove support for nose plugin
 - Remove support for cucumber tests

2.5.3 v0.8.5

Release Date: 2016-09-06

- Extra options for `assertConditionWithWait` [#42](#)

2.5.4 v0.8.4

Release Date: 2016-09-01

- Bug fix: `assertConditionWithWait` [#40](#)

2.5.5 v0.8.3

Release Date: 2016-08-12

- Bug fix: Fix for IE with remote [#38](#)
- Bug fix: `StaleElementReferenceException` handling [#33](#)

2.5.6 v0.8.2

Release Date: 2015-12-22

- New `filter_by` argument that accepts conditions

2.5.7 v0.8.1

Release Date: 2015-10-30

- Bug fix: Fix setup requirements for python 3.x [#30](#)

2.6 v0.8

Release Date: 2015-06-07

- No functional Change

2.6.1 v0.7.9

Release Date: 2015-05-30

- Bug fix: Support for phantom 1.9.x [#29](#)

2.6.2 v0.7.8

Release Date: 2014-11-02

- Bug fix: AttributeError when comparing with None [#26](#)
- Bug fix: Negative indexing in sections [#27](#)

2.6.3 v0.7.7

Release Date: 2014-09-05

- Bug fix: IE Driver initialization [#24](#)

2.6.4 v0.7.6

Release Date: 2014-07-14

- Hot fix: broken installation due to missing requirements

2.6.5 v0.7.5

Release Date: 2014-07-14

- Bug fix for StaleElementReferenceException in WebDriverWait
- Support for using `holmium.core.conditions` objects as [context managers](#)
- Additional conditions ANY and ALL for element collections.

2.6.6 v0.7.4

Release Date: 2014-04-24

- Bug fix: Sections weren't working for index > 1 [#22](#)

2.6.7 v0.7.3

Release Date: 2014-03-14

- Add missing timeout from Section

2.6.8 v0.7.2

Release Date: 2014-02-22

- exclude packaging tests

2.6.9 v0.7.1

Release Date: 2014-02-18

- Fix packaging problem with versioneer

2.7 v0.7

Release Date: 2014-02-10

- Built-in `conditions` for explicit waits
- New assertion `assertConditionWithWait`
- Change behavior of `only_if` to not check `is_displayed` by default.
- Tweaks
- Allow passing a filename for nose argument `--holmium-capabilities`
- Change versioning to use versioneer
- Explicit py3k support with six
- Make primitive lists and maps wrapped in pageobjects behave.

2.7.1 v0.6.2

Release Date: 2014-01-15

- Bug fix [issue 19](#)

2.7.2 v0.6.1

Release Date: 2013-12-23

- Bug fix [issue 18](#) for facet clobbering when page inheritance was involved
- Bug fix [issue 17](#) for case of no browser specified
- new assertion for TestCase class : `assertElementAttributeEqual`

2.8 v0.6

Release Date: 2013-12-14

- Lazy driver initialization. The webdriver is created when the test first accesses it.
- Support for using multiple browsers (drivers) in test cases. The original `self.driver` is still available along with a `self.drivers` list which lazily initializes new drivers as they are accessed via index. `drivers[0] == driver`.
- New environment variable / nose option to force browser(s) to be shutdown and restarted between tests. (it is disabled by default, but cookies are still always cleared between tests)
- New assertions added to the TestCase base class
- Documentation cleanups

- Bug fixes for default timeout/only_if argument for Element/Elements/ElementMap

2.8.1 v0.5.2

Release Date: 2013-12-09

- PyPy support
- Allow customization of WebElements by exposing [ElementEnhancer](#)

2.8.2 v0.5.1

Release Date: 2013-12-01

- Re-added python 2.6 support

2.8.3 v0.5.0

Release Date: 2013-12-01

- Python 3.3 now supported and tested.

2.8.4 v0.4.2

Release Date: 2013-12-01

- New parameter **only_if** (callable that accepts the webelement that was found) accepted by Element, Elements, ElementMap that allows for waiting for an element to become valid according to the response of **only_if**. The callable will be checked until the timeout parameter set on the Element.

2.8.5 v0.4.1

Release Date: 2013-11-29

- Bug fix for config module being reused between test runs.

2.9 v0.4

Release Date: 2013-11-28

- Old style class names removed ([Deprecated old class names](#))
- Introduced [Facets](#)
- Introduced [Cucumber Features](#) integration with [fresher](#).
- General refactoring and code cleanup.

2.9.1 v0.3.4

Release Date: 2013-11-21

- Added support to ignore ssl certificate errors on chrome, firefox & phantomjs
- code cleanup
- improved test coverage

2.9.2 v0.3.3

Release Date: 2013-10-29

- Improved back reference access in Config object by allowing variable references without requiring a prefix of *default* or the environment name. The resolution order is current environment and then default.

For example, the following config will resolve *login_url* as **http://mysite.com/login** and *profile_url* as **http://mysite.com/profile/prod_user** respectively, when *holmium.environment* is set to **production**

```
config = { "default" : {  
    "login_url" : "{{url}}/login"  
    , "profile_url": "{{url}}/profiles/{{username}}"  
  , "production": {  
    "url": "http://mysite.com"  
    , "username": "prod_user"  
  }  
}
```

2.9.3 v0.3.2

Release Date: 2013-10-10

- Fluent response from page objects only when page method returns None

2.9.4 v0.3.1

Release Date: 2013-09-17

- Allow indexing of Sections objects

2.10 v0.3

Release Date: 2013-09-16

- Bug Fix for instantiating multiple instances of the same the Page object (<https://github.com/alisaiffee/holmium.core/issues/4>)
- *Section object* introduced

2.11 v0.2

Release Date: 2013-09-11

- [Deprecated old class names](#) (PageObject, PageElement, PageElements, PageElementMap & HolmiumTestCase)
- Added more tests for holmium.core.TestCase
- New [Config](#) object.

2.11.1 v0.1.8.4

Release Date: 2013-09-04

- Bug Fix : installation via pip was failing due to missing HISTORY.rst file.

2.11.2 v0.1.8.3

Release Date: 2013-08-12

- Bug fix
 - improved error handling and logging for missing/malformed config file.

2.11.3 v0.1.8

Release Date: 2013-03-18

- Added iphone/android/phantomjs to supported browsers
- Bug fix
 - fixed phantomjs build in travis

2.12 License

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