

**DESIGN DECISIONS FOR
PERFECT JAVASCRIPT TESTING FRAMEWORK**

Michael Bodnarchuk 2019

ABOUT ME

- Michael Bodnarchuk **@davert**
- Web developer from Kyiv, Ukraine
- Lead developer of **CodeceptJS**
- Open-source contributor
- Tech **Consultant**, CTO at SDCLabs

MY VISION

- Tests should be simple to write and understand
- Tests have their priority. Don't write tests for everything
- Tests should follow business values
- Testing should be joyful

SO YOU WANT SOME BROWSER TEST AUTOMATION?



JAVASCRIPT IS THE FUTURE

FOR TEST AUTOMATION

JAVASCRIPT!

- Simple language*
- Rich ecosystem
- Not limited to Selenium
- In browser execution

***JAVASCRIPT IS SIMPLE EXCEPT**

PROMISES

LET'S MAKE A SNOWMAN

1. Testing Framework
2. Assertion library
3. Browser Driver
4. Runner



TESTING FRAMEWORK

How tests are written

- mocha
- jasmine
- cucumber
- jest
- ava

Testing frameworks are pretty much the same for e2e

ASSERTION LIBRARIES

How to make assertions

- chai
- framework-relevant
- native assert

In NodeJS assertion libraries are decoupled from a testing framework.

BROWSER DRIVER

- selenium-webdriver
- Protractor
- webdriverio
- Cypress.io
- Puppeteer
- TestCafe
- NightwatchJS
- NightmareJS

RUNNER

CLI tool to execute tests

- mocha
- protractor
- wdio
- cypress
- testcafe

IN DETAILS

BROWSER CONTROL

Internal | External

Test Architecture x GitHub - Codeception x

Secure | <https://github.com/Codeception/Codeception>

Features Business Explore Marketplace Pricing This repository Search Sign in or Sign up

Codeception / Codeception Watch 193 Star 3,274 Fork 1,1

Code Issues 370 Pull requests 11 Projects 0 Wiki Insights

Full-stack testing PHP framework <http://codeception.com>

codeception php phpunit bdd testing end-to-end acceptance-testing unit-testing integration-testing

6,308 commits 9 branches 122 releases 532 contributors MIT

Branch: 2.4 New pull request Find file Clone or download

vi4o and DavertMik Add session snapshot deletion (#4909) Latest commit 36ae135 22 hours ago

docs	updated docs, removed mentions of Cept format	11 days ago
ext	updated docs, updated statuses for readme	a month ago
package	Added init command to phar file (#4627)	5 months ago
src/Codeception	Add session snapshot deletion (#4909)	22 hours ago
tests	Add session snapshot deletion (#4909)	22 hours ago
.gitattributes	added .gitattributes	3 years ago
.../projects	.../projects	2 months ago

SELENIUM-WEBDRIVER

- Official library of Selenium
- The most used Selenium library in NodeJS
- Documentation?
- Repository?

PROTRACTOR

- Selenium (built on top of official library)
- Good Documentation
- Jasmine Testing Framework
- Angular support
- Java-like syntax
- Ooooooutdated
- Protractor 6 will break everything



EXAMPLE

```
beforeEach(function() {
  browser.get('http://www.angularjs.org');
  todoList = element.all(by.repeater('todo in todoList.todos'));
});

it('should add a todo', function() {
  var addTodo = element(by.model('todoList.todoText'));
  var addButton = element(by.css('[value="add"]'));

  addTodo.sendKeys('write a protractor test');
  addButton.click();

  expect(todoList.count()).toEqual(3);
  expect(todoList.get(2).getText()).toEqual('write a protractor test');
});
```

NIGHTWATCH

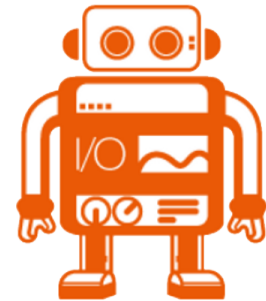
- Mastodon of web testing in JS
- Selenium (JSON-Wire) based
- Everyone used it before
- Everyone tries to migrate from it...
- But they have fancy logo



```
this.demoTestGoogle = function (browser) {  
  browser  
    .useXPath() // every selector now must be xpath  
    .click("//tr[@data-recordid]/span[text()='Search Text']")  
    .useCss() // we're back to CSS now  
    .setValue('input[type=text]', 'nightwatch')  
  browser.expect  
    .element('body')  
    .to.have.attribute('class')  
    .which.contains('found-item');  
};
```

WEBDRIVERIO

- Alternative Selenium implementation
- Mobile testing (Native Apps) with Appium
- Awesome documentation
- v4 to v5 upgrade...
- W3C spec + JSONWire spec
- Standalone / Jasmine / Mocha / Cucumber integration



EXAMPLE

```
// page object
class FormPage extends Page {
    get username () { return $('#username') }
    get password () { return $('#password') }
}
// test
browser.url('/form');
FormPage.username.setValue('foo')
FormPage.password.setValue('bar')
FormPage.submit()
```


CYPRESS.IO




- Chrome-based, runs inside a browser
- Mocha testing framework + chai assertions
- UI Debugger
- Good documentation
- Auto retry failed steps
- [LIMITATIONS!!!](#)
 - No XPath
 - No file uploads
 - No multiple browsers, multiple tabs
 - No iframes

EXAMPLE

```
it('adds 2 todos', function () {
  cy.visit('/');
  cy.get('.new-todo')
    .type('learn testing{enter}')
    .type('be cool{enter}')
  cy.get('.todo-list li').should('have.length', 2)
})
```

Selenium vs. Cypress: Is WebDriver on Its Way Out?

by Alex McPeak  · Jun. 14, 18 · Open Source Zone · Analysis

Blog NTestsRunner Automation SMTP Server About

Cypress vs. Selenium, is this the end of an era?

Last Updated on 06.06.2018 by [LysadmiLalinox](#)

Why you should switch to Cypress for modern web testing?

 Shivam Bharadwaj [Follow](#)
Jun 10, 2018 · 7 min read

“I think you’ll agree with me when I say...Test your code not your patience”

So, What I mean with the above line is that we are in an era where web is evolving extremely with the deployment of [angular.js](#), [react.js](#), [Vue.js](#) and [p5.js](#) based web applications. These modern web applications are responsive, communicative(using catbots) and built on top of material design.



CYPRESS.IO AND THE FUTURE OF WEB TESTING

HNLOGIES · PROCESSES, STANDARDS AND QUALITY · ABOUT US · CONTACT

23.08.2018

YOUR TEST AUTOMATION FRAMEWORK COST?


Cypress – the reason why we’re not stuck with Selenium

PIOTR KLEJNOWSKI

MAIN PAGE

CATEGORIES

HOW MUCH DOES YOUR TEST AUTOMATION FRAMEWORK COST? HOW CYPRESS WILL MAKE YOU LOVE FRONTEND TESTING

 JULIA RAMSTEDT

GoDaddy

Open Source HQ

The screenshot displays the Crunchbase website interface. At the top, there is a navigation bar with the Crunchbase logo and links for Products, Marketplace, News, and About. A search bar is located on the right side of the navigation bar. Below the navigation bar, a sidebar on the left contains various categories such as Companies, People, Investors, Funding Rounds, Acquisitions, Schools, Events, and Hubs. The main content area shows a search filter for "Organization Name" with the value "Cypress.io" and a dropdown menu set to "includes any". The search results are displayed in a table with columns for Transaction Name, Organization Name, Funding Type, and Money Raised. The results show three seed rounds for Cypress.io, with a total funding amount of \$5.5M.

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List of **Cypress.io's 3 Funding Rounds** totaling **\$5.5M**

Organization Name includes any Cypress.io x Crunchbase, Slack, Lyft

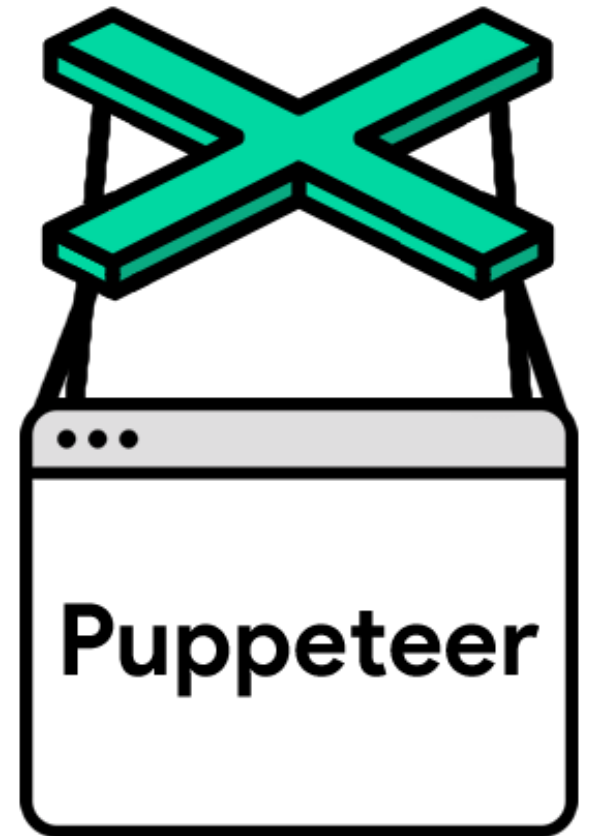
Search 3 results in 0.03s Statistics Columns

Transaction Name	Organization Name	Funding Type	Money Raised
1. Seed Round - Cyp...	Cypress.io	Seed	\$4,000,000
2. Seed Round - Cyp...	Cypress.io	Seed	\$600,000
3. Seed Round - Cyp...	Cypress.io	Seed	\$909,298

Cypress.io is over-estimated as end 2 end testing framework

PUPPETEER

- Official Google Chrome DevTools library
- Standalone library (no testing framework)
- Good API Documentation
- Provides full browser control
- Headers, Mock requests, Responses
- Multi tab control, incognito mode
- Iframes, file upload...



EXAMPLE

```
beforeEach(async () => {
  const page = await browser.newPage()
  await page.setViewport({ width: 1280, height: 800 })
  await page.goto('https://www.walmart.com/ip/Super-Mario-Odyssey-Nint
  await page.click('button.prod-ProductCTA--primary')
  await page.waitForSelector('.Cart-PACModal-ItemInfoContainer')
  await page.screenshot({path: screenshot})
  await browser.close()
});
```

TESTCAFE

- Cross-browser client-side testing
- Proxy server for mocking all requests
- Doesn't control browser
- Custom test framework, assertions, runner
- Parallel execution built-in
- Multi-browser setup



EXAMPLE

```
test('Dealing with text using keyboard', async t => {
  await t
    .typeText(page.nameInput, 'Peter Parker') // Type name
    .click(page.nameInput, { caretPos: 5 }) // Move caret position
    .pressKey('backspace') // Erase a character
    .expect(page.nameInput.value).eql('Pete Parker') // Check result
    .pressKey('home right . delete delete delete') // Pick even shorter
    .expect(page.nameInput.value).eql('P. Parker'); // Check result
});
```

HOW TO CHOOSE DRIVER

- Learn how the tool works
- Consider its limitations
- Check documentation
- Upgrade strategy
- Look into source code

ASYNCHRONITY

*In JavaScript all browser commands are **promises***

Driver	Strategy
selenium-webdriver	async/await
Protractor 5	control flow
Protractor 6	async/await
webdriverio	sync fibers, async/await
cypress	control flow
Puppeteer	async/await
TestCafe	async/await

HOW TO CHOOSE TESTING FRAMEWORK

- Use the one provided by driver
- Except...

...CUCUMBER

- Has its own runner & testing framework
- To hide JS complexity
- To work as BDD tool
- Supported by standalone libraries
 - Protractor
 - WebDriverIO
 - Puppeteer



EXAMPLE

Feature: Visit the app dashboard

As a citizen

I should be able to log in to the app with DigiD

In order to access my personal information

Scenario: Log in with DigiD

Given I am logged in with DigiD as 123456789

And there are the following toggles: personal

When I visit the dashboard

Then I should be greeted with H.A. Janssen

CONCLUSIONS

- Get your requirements
- Learn ecosystem
- Choose the testing stack

LET'S BUILD PERFECT TESTING FRAMEWORK!



WE DID IT!



...but not that snowman!

WHATEVER YOU CHOOSE, YOU LOSE!

- New testing frameworks emerge
- Cool fancy library will be legacy tomorrow
- You hit issues with edge cases
- Different API
- You can't migrate your code

SURVIVE THE CHANGE

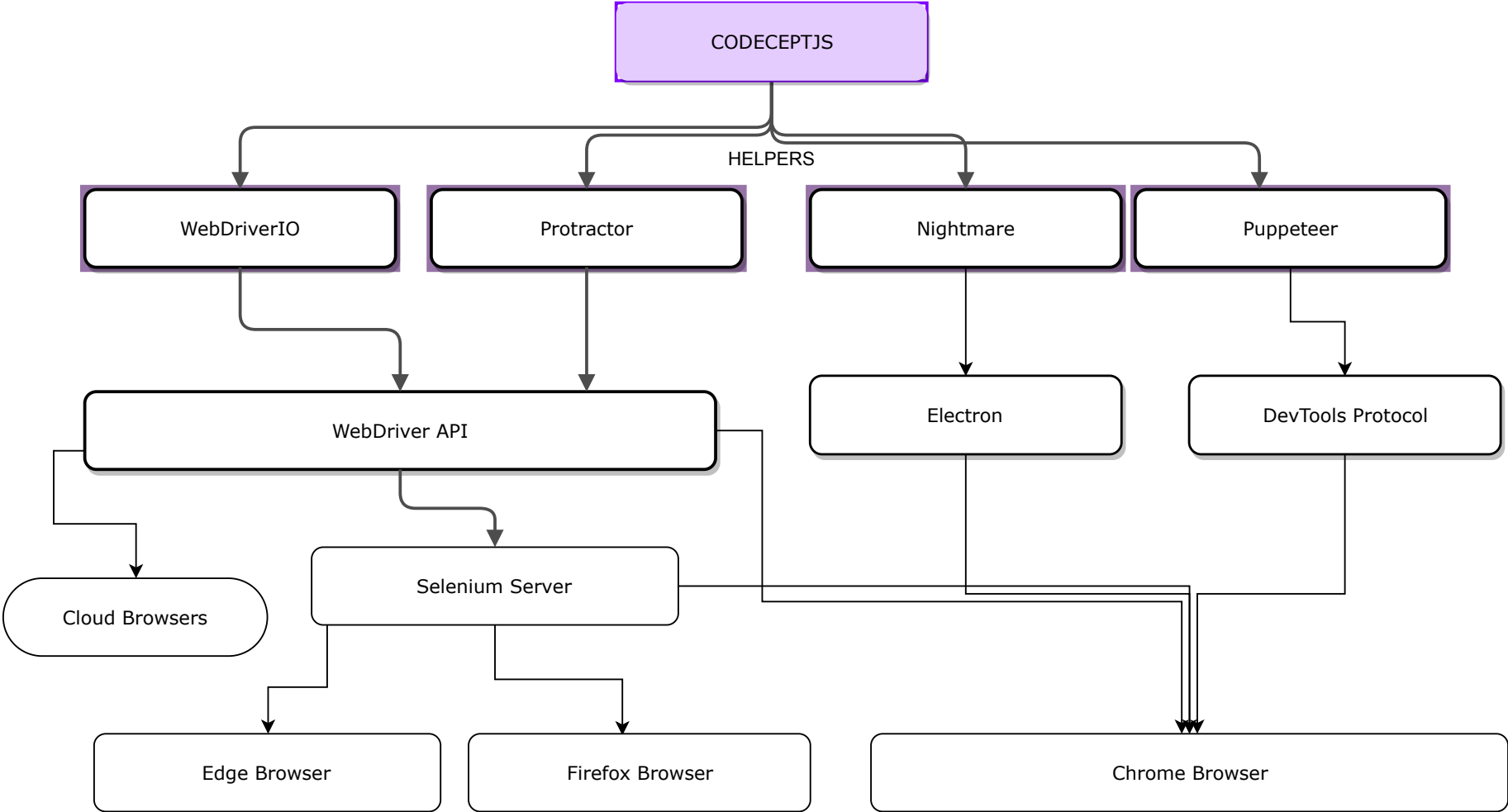
- Write high level test code
- Separate scenario from browser control
- Use Cucumber or **CodeceptJS**

CODECEPTJS

- Multi-driver testing framework
 - webdriverio
 - Puppeteer
 - Protractor
- Custom runner, mocha-based test framework
- High level API (with Cucumber support)
- Interactive debug mode
- Auto retry failed steps



ARCHITECTURE



EXAMPLE

```
Scenario('todomvc', (I, loginPage) => {
  const user = await I.createUser('davert');
  loginPage.login(davert);
  I.see('davert', 'nav');
  I.click('Create Todo');
  I.see('1 item left', '.todo-count');
  I.fillField('What needs to be done?', 'Write a test');
  I.pressKey('Enter');
  I.see('Write a test', '.todo-list');
  I.see('2 items left', '.todo-count');
  I.fillField('What needs to be done?', 'Write a code');
  I.pressKey('Enter');
  I.see('Write a code', '.todo-list');
  I.see('3 items left', '.todo-count');
});
```

LIVE DEVELOPMENT

```
I.amOnPage ( '/' );  
pause ( );
```

- Call `pause ()` to interrupt the test
- Use interactive shell to try different commands
- Copy successful commands into a test

CONCLUSIONS

- For advanced e2e testing use **webdriverio**
- For full browser control use **puppeteer**
- For high-level automated e2e tests use **codeceptjs**
- For component testing use **cypress.io**
- For simple multi-browser testing use **testcafe**
- For BDD use CucumberJS

THANK YOU!

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