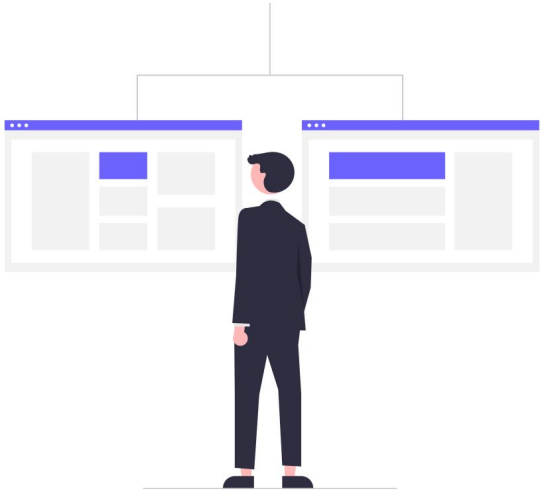
cypress

Fast, easy and reliable testing for anything that runs in a browser



Content

Overview of the benefits of using Cypress, comparison with Selenium-based solutions and a short demo / live-coding session.

- What is Cypress
- Main Features
- Comparison
- Structure & Performance
- Demo

Terminology

- **End-to-end testing** = testing general user flows
- **Assertions** = expression at a specific point in a program which will be true unless there is a bug in the program
- **Spy / Mock** / **Stub** = fake methods / objects used for testing purposes

Context

- Focus on end-to-end testing
- End-to-end testing coverage is perceived as being a slow and time consuming process
- Expensive to maintain tests suite
- Sync is often required between development / testing
- E2E requires complex infrastructure to be added in CI

What is Cypress?

Functional automation test runner for web applications

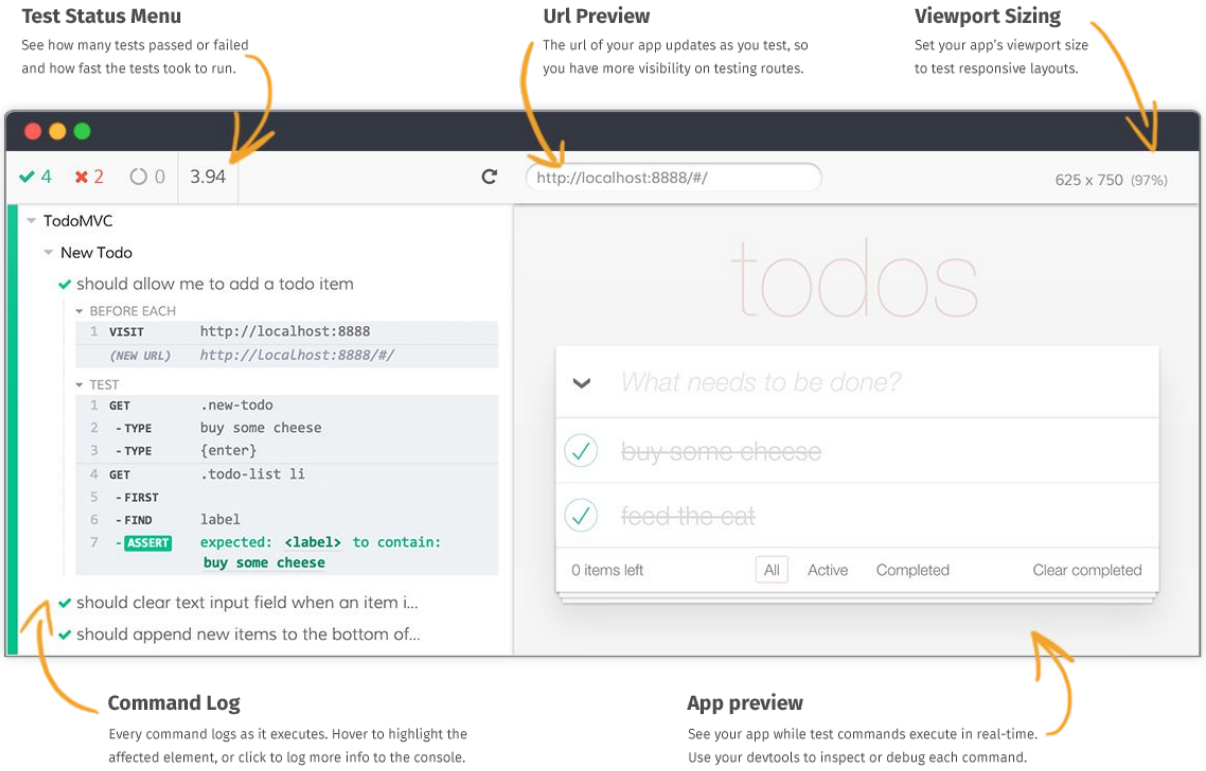
Launched in 2017, has a growing community and reached a mature state

What is Cypress?

- Made for developers & QA engineers (easy to write, test, debug)
- Not based on Selenium (new architecture)
- All-in-one testing framework
- Open source

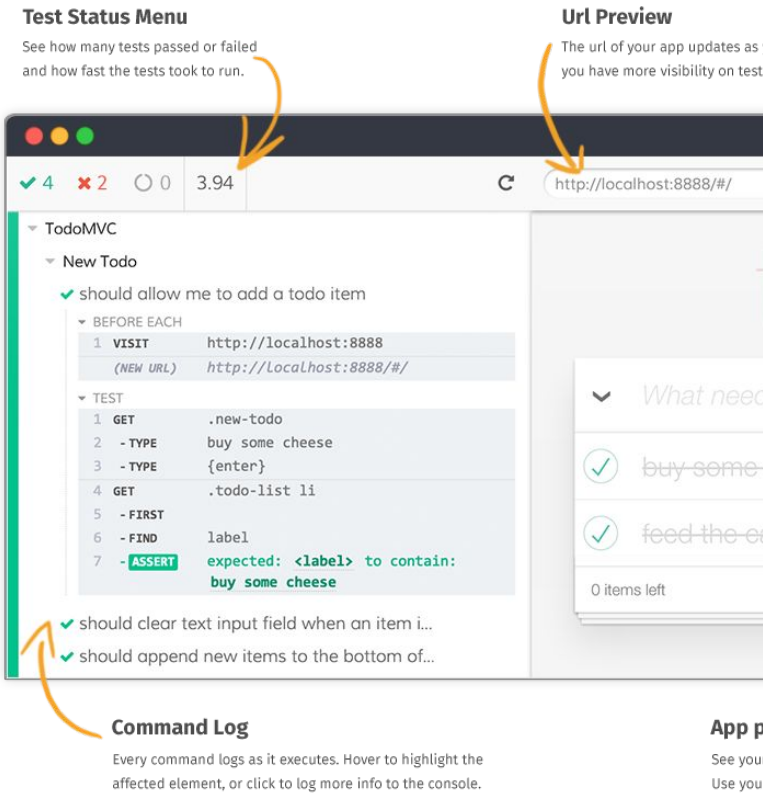
Main Features

- GUI Test Runner



Main Features

- GUI Test Runner
  - **Real-time reload of test changes**
  - Speeds up development
  - Easy to debug
  - Saves snapshots of each command / assert



Main Features

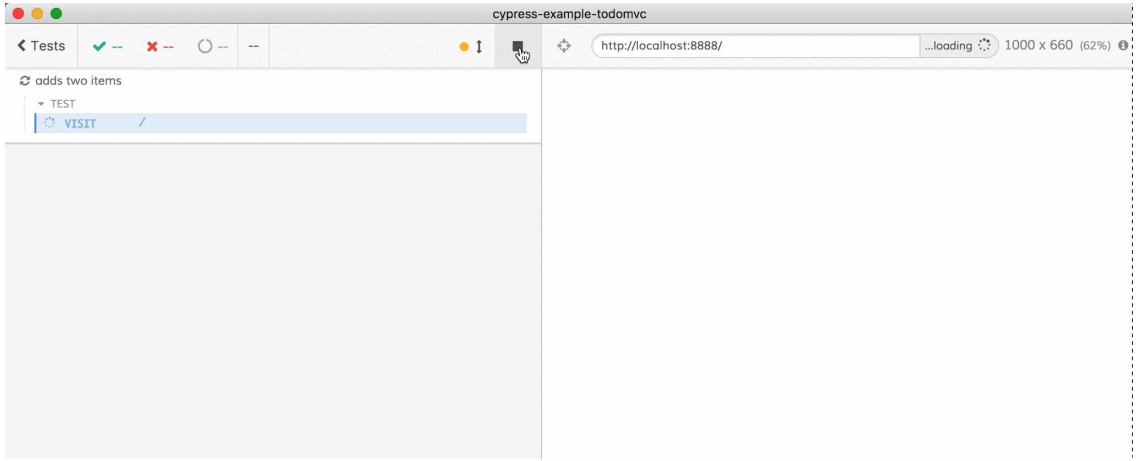
- **CLI test runner**
  - Useful for easy CI setup
  - Runs test in headless browser (e.g. Electron, Chrome)
  - View screenshots taken automatically on failure, or videos of your entire test suite when run from the CLI
- **Test parallelization**

(Run Finished)

	Spec		Tests	Passing	Failing	Pending	Skipped
√	examples\actions.spec.js	00:16	14	14	-	-	-
√	examples\aliasing.spec.js	00:02	2	2	-	-	-
√	examples\app.spec.js	00:02	1	1	-	-	-
√	examples\assertions.spec.js	00:04	9	9	-	-	-
√	examples\connectors.spec.js	00:02	8	8	-	-	-
√	examples\cookies.spec.js	00:02	5	5	-	-	-
√	examples\cypress_api.spec.js	00:03	12	12	-	-	-
√	examples\files.spec.js	00:03	4	4	-	-	-
√	examples\form.spec.js	00:05	15	15	-	-	-
√	examples\local_storage.spec.js	00:01	1	1	-	-	-
√	examples\location.spec.js	00:01	3	3	-	-	-
√	examples\misc.spec.js	00:04	6	6	-	-	-
√	examples\navigation.spec.js	00:03	3	3	-	-	-
√	examples\network_requests.spec.js	00:08	6	6	-	-	-
√	examples\querying.spec.js	00:03	5	5	-	-	-
√	examples\spies_stubs_clocks.spec.js	00:04	7	7	-	-	-
√	examples\traversal.spec.js	00:04	18	18	-	-	-
√	examples\utilities.spec.js	00:03	5	5	-	-	-
√	examples\viewport.spec.js	00:04	1	1	-	-	-
√	examples\waiting.spec.js	00:06	2	2	-	-	-
√	examples\window.spec.js	00:01	3	3	-	-	-
√	All specs passed!	01:33	130	130	-	-	-

Main Features

- **Automatic waiting**
  - Automatically waits for commands and assertions before moving on
  - Doesn’t need specific timeouts / wait statements in tests
  - Built internally by using a retry-ability mechanism (4s default)



Main Features

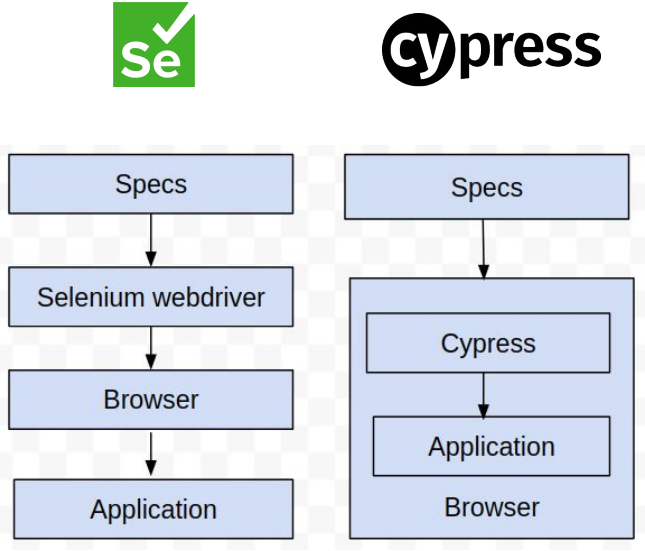
- **Time travel & Debugging**
  - Cypress takes snapshots as your tests run
  - Can navigate at any command / assertion from any test from the suite
  - Readable errors and stack traces make debugging easier

Main Features

- **Native access to application and network traffic control**
  - Can mock network requests
  - Verify and control the behavior of functions, server responses, or timers using spies, stubs or clocks
  - **Can take shortcuts programmatically** (e.g. login) while maintaining tests sandboxing
  - Emulates same-origin policies to meet web security checks (e.g. CORS)

Comparison

Architecture



Cypress

- **Easy setup / easy to write / easy debug**
- Native access to application (Node.js process)
- All-in-one framework
- Growing Community

Selenium

- **Complex setup / more difficult to write & maintain**
- Application access through WebDriver
- Requires testing framework, assertion library
- Established community

Cypress

- Supports only Javascript language
- No support for multiple browser testing
- Limited browser support (Chrome, Firefox, Edge, Electron)

Selenium

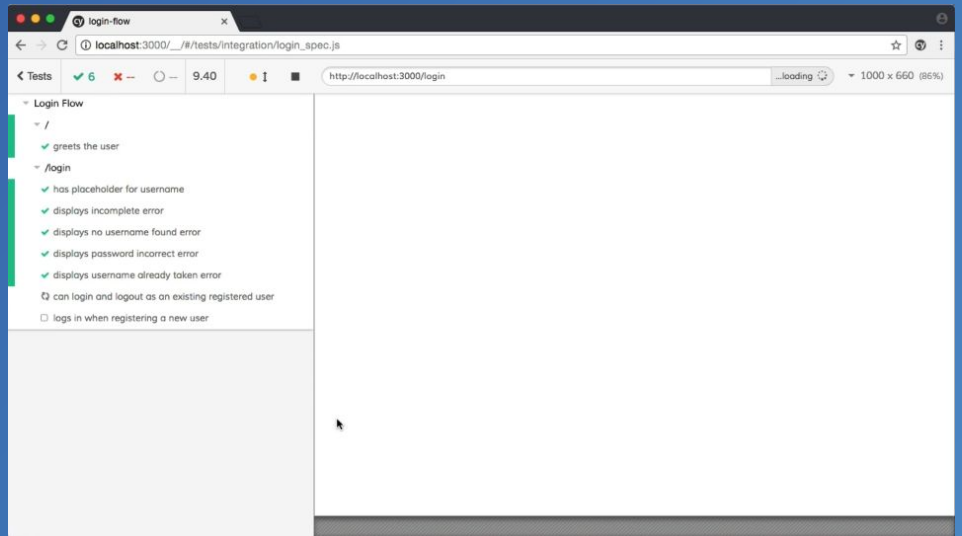
- Supports all popular languages (e.g. Java, Python)
- Supports multiple browser testing
- Supports all browsers
- Supports multiple testing frameworks

To summarize

- Cypress has a completely different architecture
- Has native access to everything (runs inside the browser), including network requests & can interact directly with application state
- Can take shortcuts programmatically
- Not flaky (automatic waiting)
- It’s fast (since it runs natively)
- Very easy to debug

Structure & Performance

A few words about how to write tests



Project Structure

- Default folder structure
  - **Fixtures**: test demo data
  - **Screenshots / Video**: test recordings
  - **Integration**: test suites
  - **Plugin**: custom scripts to be run on the Node.js process level
  - **Support**: common logic reusable by all test suites

```
/cypress
  /fixtures
    - example.json

  /integration
    /examples
      - actions.spec.js
      - aliasing.spec.js
      - assertions.spec.js
      - connectors.spec.js
      - cookies.spec.js
      - cypress_api.spec.js
      - files.spec.js
      - local_storage.spec.js
      - location.spec.js
      - misc.spec.js
      - navigation.spec.js
      - network_requests.spec.js
      - querying.spec.js
      - spies_stubs_clocks.spec.js
      - traversal.spec.js
      - utilities.spec.js
      - viewport.spec.js
      - waiting.spec.js
      - window.spec.js

  /plugins
    - index.js

  /support
    - commands.js
    - index.js
```

Test Structure

- Flexible syntax, built on top of Mocha and Chai
- The test interface
  - describe() or context()
  - it() or specify()
  - beforeEach(), beforeAll()
  - afterEach(), afterAll()

```
// -- Start: Our Application Code --
function add(a, b) {
  return a + b
}

function subtract(a, b) {
  return a - b
}

function divide(a, b) {
  return a / b
}

function multiply(a, b) {
  return a * b
}
// -- End: Our Application Code --

// -- Start: Our Cypress Tests --
describe('Unit test our math functions', () => {
  context('math', () => {
    it('can add numbers', () => {
      expect(add(1, 2)).to.eq(3)
    })

    it('can subtract numbers', () => {
      expect(subtract(5, 12)).to.eq(-7)
    })

    specify('can divide numbers', () => {
      expect(divide(27, 9)).to.eq(3)
    })

    specify('can multiply numbers', () => {
      expect(multiply(5, 4)).to.eq(20)
    })
  })
})
// -- End: Our Cypress Tests --
```

Performance & Best practices

- Programmatic login to drastically reduce tests time
- Tests should run independently
- Re-use generic tests
- Avoid writing ‘tiny’ tests

```
describe('my form', () => {
  before(() => {
    cy.visit('/users/new')
    cy.get('#first').type('johnny')
  })

  it('has validation attr', () => {
    cy.get('#first').should('have.attr', 'data-validation', 'required')
  })

  it('has active class', () => {
    cy.get('#first').should('have.class', 'active')
  })

  it('has formatted first name', () => {
    cy.get('#first').should('have.value', 'Johnny') // capitalized first
  })
})
```

```
describe('my form', () => {
  before(() => {
    cy.visit('/users/new')
  })

  it('validates and formats first name', () => {
    cy.get('#first')
      .type('johnny')
      .should('have.attr', 'data-validation', 'required')
      .and('have.class', 'active')
      .and('have.value', 'Johnny')
  })
})
```

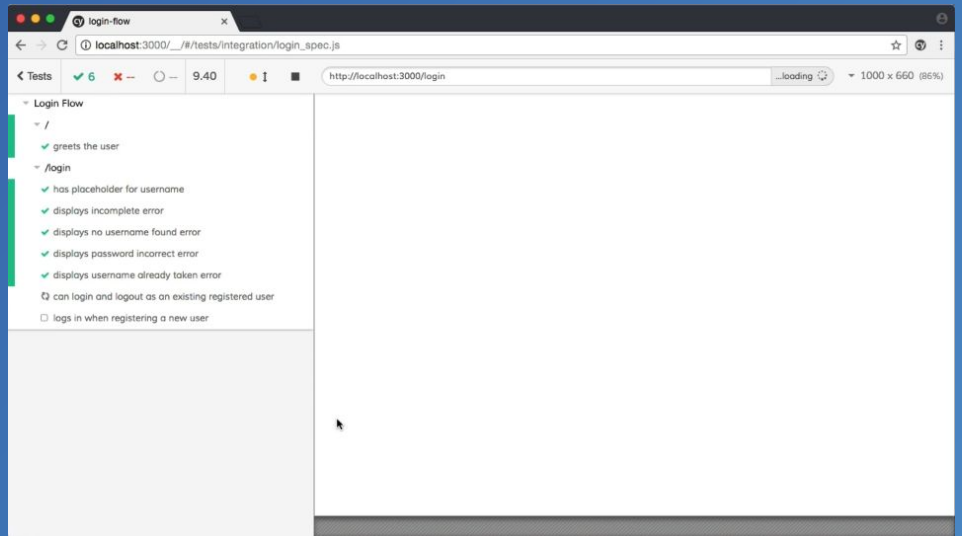
Performance & Best practices

- Use Cypress specific selectors to avoid flaky tests
- Cypress wraps all DOM queries with robust retry-and-timeout logic

Selector	Recommended	Notes
`cy.get('button').click()`	⚠ Never	Worst - too generic, no context.
`cy.get('.btn.btn-large').click()`	⚠ Never	Bad. Coupled to styling. Highly subject to change.
`cy.get('#main').click()`	⚠ Sparingly	Better. But still coupled to styling or JS event listeners.
`cy.get('[name=submission]').click()`	⚠ Sparingly	Coupled to the `name` attribute which has HTML semantics.
`cy.contains('Submit').click()`	✔ Depends	Much better. But still coupled to text content that may change.
`cy.get('[data-cy=submit]').click()`	✔ Always	Best. Isolated from all changes.

Demo

Live test run



Thank you!

Bibliography

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