

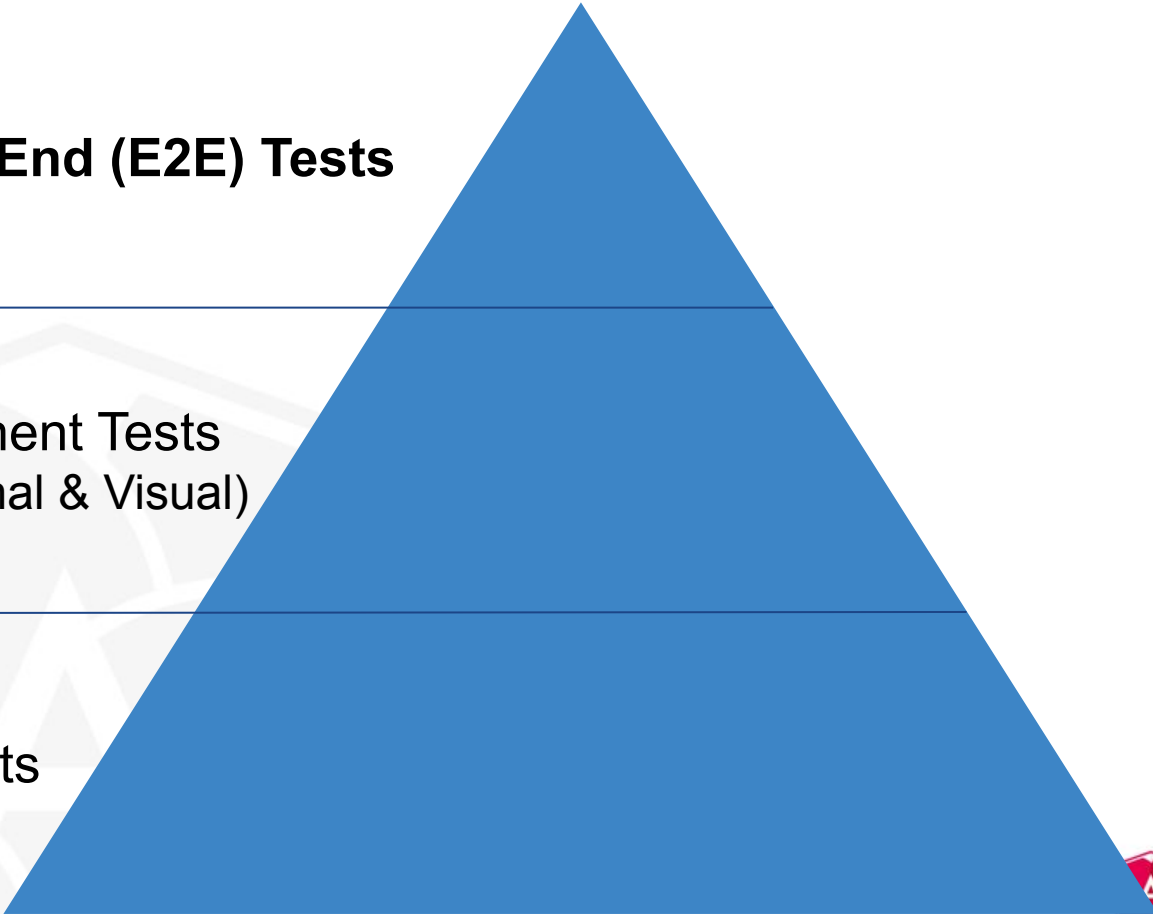


ANGULAR  
**ARCHITECTS**  
INSIDE KNOWLEDGE

# Angular Testing

## 1 - E2E Basics

**End-to-End (E2E) Tests**

A blue pyramid diagram is positioned on the right side of the slide. It is divided into three horizontal sections by two thin blue lines. The top section is the smallest, the middle section is medium-sized, and the bottom section is the largest. To the left of the pyramid, the text 'End-to-End (E2E) Tests' is aligned with the top section, 'Component Tests (Functional & Visual)' is aligned with the middle section, and 'Unit Tests' is aligned with the bottom section. The pyramid itself is a solid blue color.

**Component Tests  
(Functional & Visual)**

**Unit Tests**



ANGULAR  
**ARCHITECTS**  
INSIDE KNOWLEDGE

## 2 Core Technologies for E2E Frameworks

1. WebDriver
2. Chrome DevTool Protocol (CDP)



ANGULAR  
**ARCHITECTS**  
INSIDE KNOWLEDGE

# WebDriver

- W3C Standard
- Cross-Browser Support
- Known to be flaky
- WebDriver BiDi as successor
- Popular E2E Tools
  - Protractor
  - Selenium
  - NightWatch
  - WebDriverIO



# CDP (Chrome DevTools Protocol)

- Debugging Tool for Chromium-based Browsers
- Puppeteer as primary library
- Playwright incl. Safari
- Much more stable
- Constrained to CDP-Browsers



ANGULAR  
**ARCHITECTS**  
INSIDE KNOWLEDGE

Cross Browser  
Support

Reliability

WebDriver

CDP  
(Chrome DevTools Protocol)

Native



ANGULAR  
ARCHITECTS  
INSIDE KNOWLEDGE

Cross Browser  
Support

Reliability

WebDriver

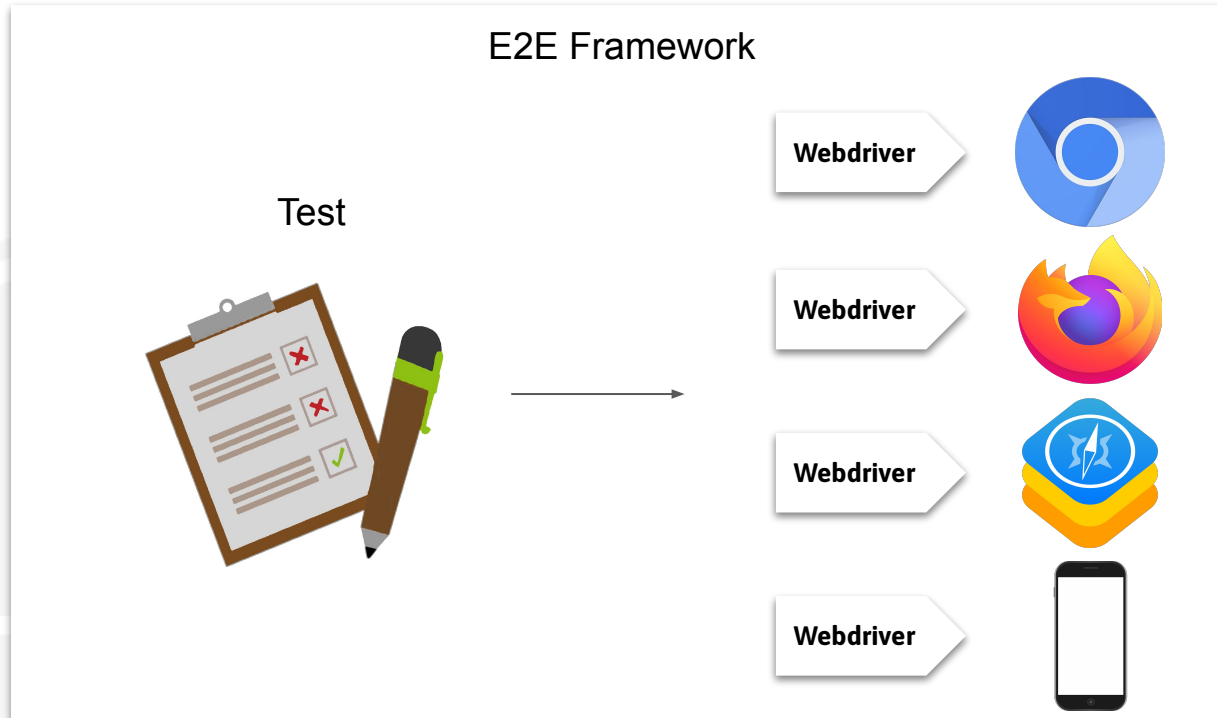
CDP  
(Chrome DevTools Protocol)

Native



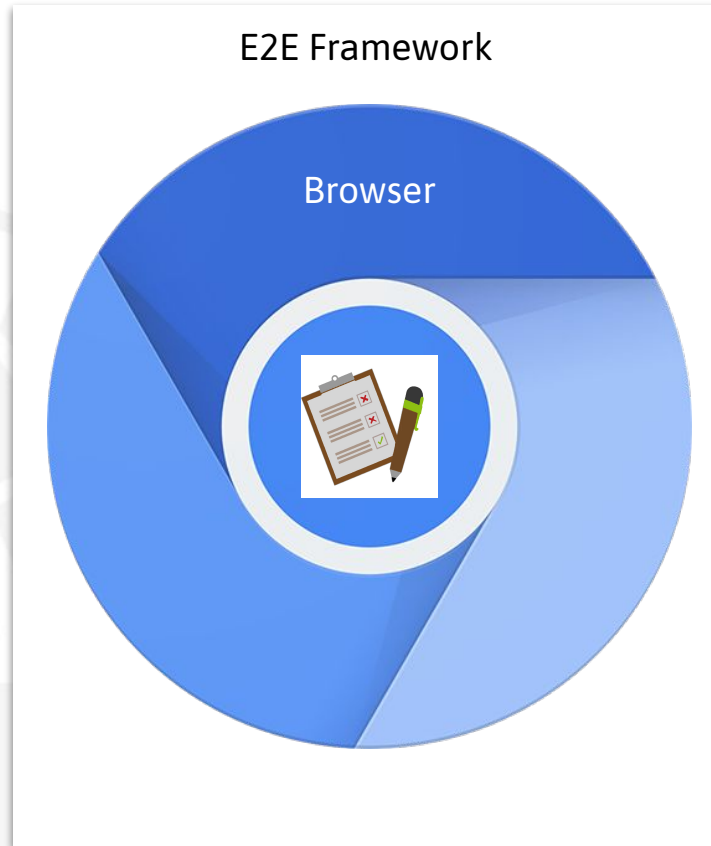
ANGULAR  
ARCHITECTS  
INSIDE KNOWLEDGE

# Selenium: Outside browser testing





# Cypress: Inside browser testing



## @playwright/test vs cypress vs nightwatch vs selenium-webdriver vs webdriverio

Enter an npm package...

@playwright/test x

cypress x

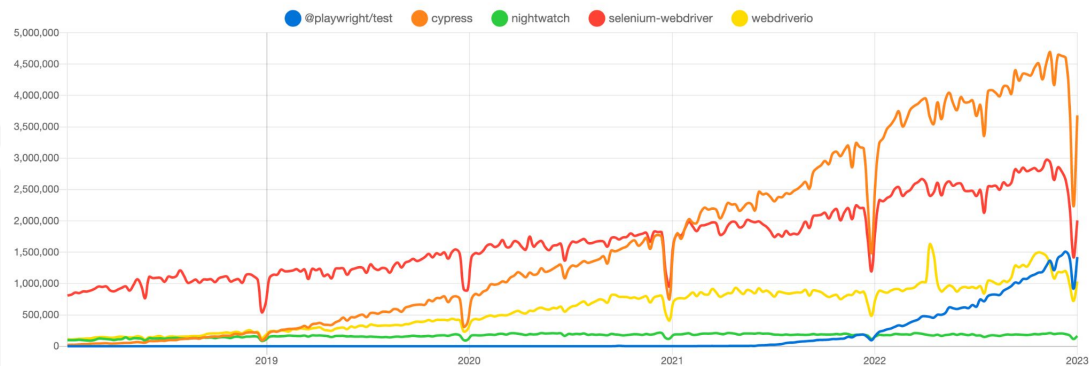
nightwatch x

selenium-webdriver x

webdriverio x

+ puppeteer + testcafe

Downloads in past 5 Years



### Stats

		Stars	Issues	Version	Updated ②	Created ②	Size
@playwright/test		46,377	702	1.29.2	4 days ago	2 years ago	
cypress		42,275	2,815	12.3.0	7 days ago	9 years ago	minzipped size 383.8 KB
nightwatch		-	-	2.6.9	11 hours ago	9 years ago	minzipped size 422.0 KB
selenium-webdriver		25,528	148	4.7.1	a month ago	10 years ago	minzipped size 117.6 KB
webdriverio		7,908	171	8.1.3	4 days ago	8 years ago	bundlephobia 429



ANGULAR  
ARCHITECTS  
INSIDE KNOWLEDGE

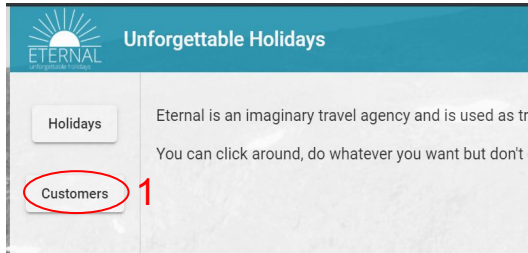
# Cypress

- Node.js Application
- Great Developer Experience
- Good Documentation
- Easy Setup
- Internal "IDE"
- CI Features like Videorecording and Screenshots

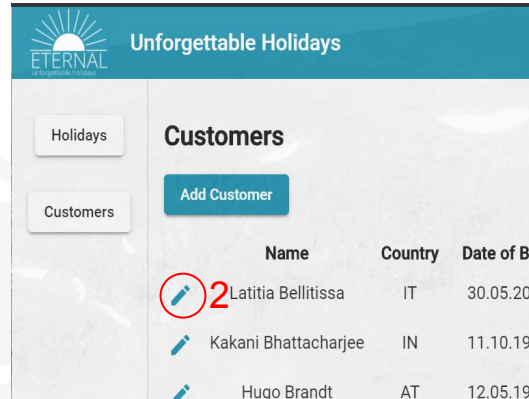


# The Await Feature "Actionability"





1. Select Customers



2. Select Customer



3. Edit Firstname



ANGULAR  
ARCHITECTS  
INSIDE KNOWLEDGE



# Unforgettable Holidays

Holidays

Customers

Firstname \*

Latitia

Name \*

Bellitissa

Country \*

Italy

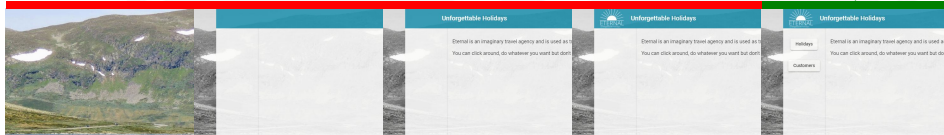
Birthdate \*

30.5.2002

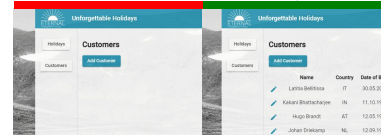


# Non-Waiting Style

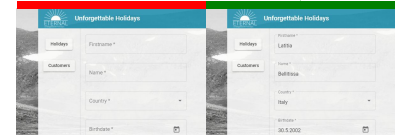
## 1. Select Customers



## 2. Select Customer

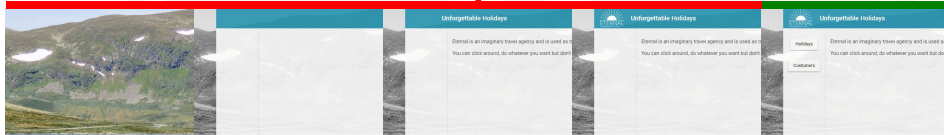


## 3. Edit Firstname

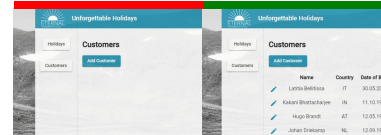


# Non-Waiting Style

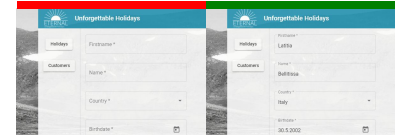
## 1. Select Customers



## 2. Select Customer



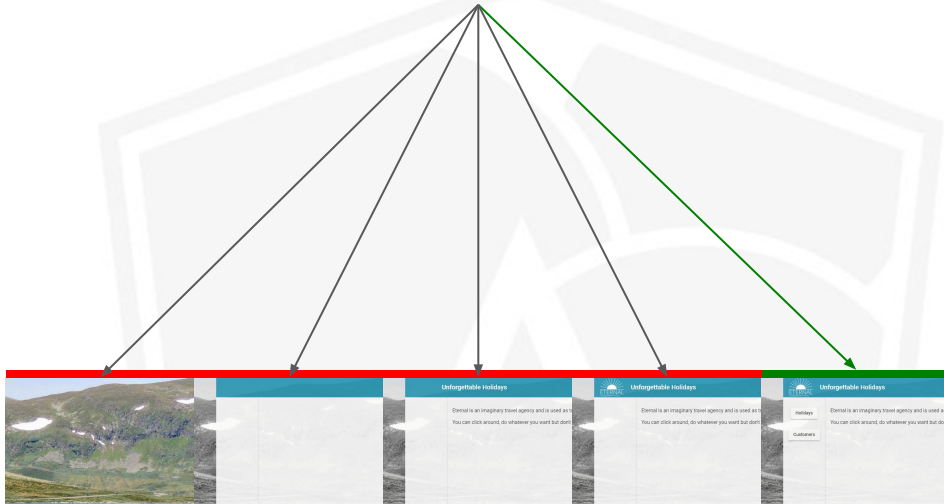
## 3. Edit Firstname



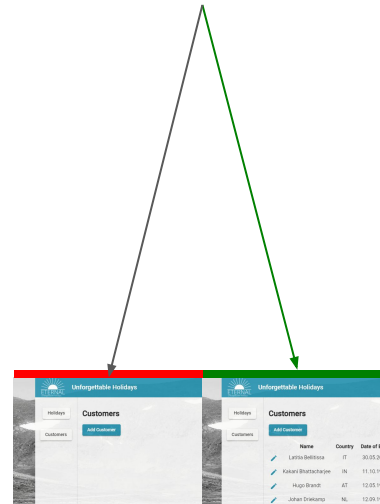


# Waiting Style

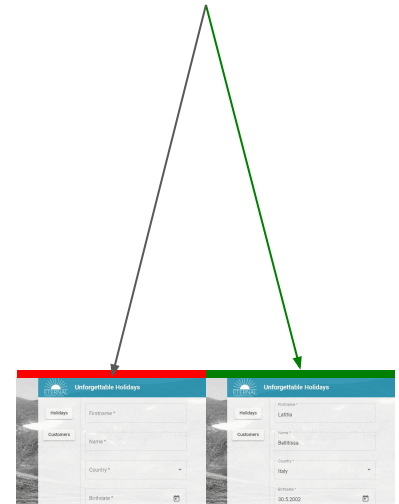
## 1. Select Customers



## 2. Select Customer



## 3. Edit Firstname



# An E2E Test in Cypress

```
it('should rename Latitia to Laetitia', () => {  
  
  cy.visit('');  
  
  cy.get('mat-drawer a').contains('Customers').click();  
  
  cy.get('div').contains('Latitia Bellitissa').siblings('.edit').click();  
  
  cy.get('input:first').clear().type('Laetitia');  
  
  cy.get('button[type=submit]').click();  
  
  cy.get('div').contains('Bellitissa').should('have.text', 'Laetitia Bellitissa');  
  
});
```



# Commands

- Methods of "cy." object
- Run asynchronously
  - "Feels" like a Promise (thenable) but isn't
  - Don't use async/await
- Are chainable



# Common Commands

## Queries

- get
- contains
- find
- sibling
- parent

## Actions

- click
- type
- clear

## Assertions

- should
  - explicit
  - implicit
- and



# Assertions Implicit

- Behaves like a normal command
- Does waiting as well
- Good for single assertions
- Chaining with and

```
cy
```

```
.get('h1')
```

```
.should(
```

```
  'have.text',
```

```
  ' Unforgettable Holidays '
```

```
);
```



# Assertions Explicit

- More verbose
- Good for multiple assertions
- Messaging

```
cy.get('h1').should(($h1) => {  
  
  expect($h1).to.have  
  
    .text(' Unforgettable Holidays ');  
  
});
```



# Selection Strategies



# Selector Strategies

## DOM-Based

- id Attribute
  - Must be unique
  - Browser-internal meaning
  - Consensus not to use it
- CSS Classes
  - Should be used Layout
  - Don't deal with functionality
- Text
  - cy.contains
  - Better to go with User-Facing Selectors
- data-testid
  - Best Practices
  - Recommended by Cypress

## User-Facing

- Use text and/or roles
- Includes partially a11y
- Testing Library Bindings for Cypress
- Careful when text changes often
  - Fallback to data-testid





# Testing-Library Selectors

1. **cy.findByRole**
2. **cy.findByLabelText**
3. cy.findByPlaceholderText
4. cy.findByText
5. cy.findByDisplayValue
6. cy.findByAltText
7. cy.findByTitle
8. cy.findByTestId




# Examples

- `cy.findByRole('link', { name: 'Holidays' })`  
`.click();`
- `cy.findByRole('button', { name: 'Save' })`  
`.click();`
- `cy.findByLabelText(/Firenze/i);`
- `cy.findByLabelText(/Latitia/)`  
`.findByRole('link', { name: 'Edit Customer' });`



# Accessibility Extension in Chrome


 **Unforgettable Holidays**

Holidays

Customers

Newsletter

**Vienna / Wien**  
Dive into the capital of the Habsburg empire




ON SALE


With a population of almost 2 million, Vienna is the second largest German-speaking city and breathes history in

Get a Brochure


**Detroit**  
Top 10 of the cosmopolitan cities of the world



**Reykjavik**  
The northernmost capital of the world and entry to Iceland



**London**  
Explore one of the world's most famous cities



Being a tourist magnet, this city needs no further introduction.

Get a Brochure

mat-card.mat-mdc-card.mdc-card.my-4.mx-4.ng-star-inserted 305 x 416

Sign In

Reload required before the change takes effect. Reload DevTools

Elements Console Sources >> 1

RootWebArea "Eternal" focusable: true focused: true

- link "Eternal Unforgettable Holidays" focusable: true
  - heading "Eternal Unforgettable Holidays"
- button "Sign In" focusable: true
  - StaticText "Sign In"
- list ""
  - listitem ""
  - listitem ""
  - listitem ""
- generic "Vienna / Wien"
- generic "London"
- generic "Detroit"
- generic "Reykjavík"
- generic "Copenhagen / København"
  - StaticText "Copenhagen / København"
  - StaticText "Europe's most livable city"
  - figure ""
    - StaticText "Copenhagen is the capital of Denmark and is located on Zealand which is one of the three main Danish islands"

Styles Computed Layout Event Listeners Accessibility >>

Accessibility Tree



ANGULAR  
ARCHITECTS  
INSIDE KNOWLEDGE

Demo



# Cypress Goodies

- lodash: Cypress.\_
- jQuery: Cypress.\$
- Uses Mocha and Chai
  - Not Jest
  - Very similar commands



# Why not Cypress?

- ~~Cross Browser Support~~ ← Chromium, Firefox, Webkit (exp.)
- ~~Multiple Super Domains~~ ← Available since v9.6
- Parallelization
- Special Requirements
  - Multiple Tabs
  - WebComponents
  - ...





Lab Time



# Flakiness / Element not found

cy

```
.get('a') // Query  
.should('have.attr', 'href') // Assertion  
.contains('Customers') // Query  
.click(); // Action
```

```
1 visit  
2 get a  
3 -assert expected <a.home> to have attribute href  
4 -contains Customers
```

! CypressError

Timed out retrying after 4000ms: cy.contains() failed because it requires a DOM element, window or document.

The subject received was:

> /

The previous command that ran was:

> cy.should()

src/e2e/init.cy.ts:3:43

```
1 | it('should open the browser', () => {  
2 |   cy.visit('');  
> 3 |   cy.get('a').should('have.attr', 'href').contains('Customer  
   |                                     ^  
4 |   // cy.get('button[role=switch]').first().click();  
5 |   cy.get('[data-testid=btn-click]') // Query  
6 |   .click() // Action
```

> View stack trace

Print to console



ANGULAR  
ARCHITECTS  
INSIDE KNOWLEDGE



# Flakiness / Undetached DOM Event

cy

```
.get('[data-testid=btn-click])' // Query

.click() // Action

.should('have.text', 'Unclick me'); // Assertion
```

- Assertion after Action
- Not retried
- Might work
  - Depends on the implementation

```
1 visit
2 get [data-testid=btn-click]
3 -click
```

## ! CypressError

Timed out retrying after 4050ms: `cy.should()` failed because the page updated as a result of this command, but you tried to continue the command chain. The subject is no longer attached to the DOM, and Cypress cannot requery the page after commands such as `cy.should()`.

Common situations why this happens:

- Your JS framework re-rendered asynchronously
- Your app code reacted to an event firing and removed the element

You can typically solve this by breaking up a chain. For example, rewrite:

```
> cy.get('button').click().should('have.class', 'active')
```

to

```
> cy.get('button').as('btn').click()
> cy.get('@btn').should('have.class', 'active') Learn more
```

[src/e2e/init.cy.ts:7:6](#)

```
5 |   cy.get('[data-testid=btn-click]) // Query
6 |   .click() // Action
> 7 |   .should('have.text', 'Unclick me'); // Assertion
    |   ^
8 | });
9 |
```

> [View stack trace](#)

[Print to console](#)

# Flakiness / Unreachability

cy

```
.get('button[role=switch]')
```

```
.first()
```

```
.click();
```

- Use parent element
  - Doesn't have to be an input/button
- Typical Error in UI Libraries

## ! CypressError

Timed out retrying after 4050ms: cy.click() failed because this element:

```
<button role="switch" type="button" class="mdc-switch mdc-switch--selected mdc-switch--checked" tabindex="0" id="mat-mdc-slide-toggle-1-button" aria-labelledby="mat-mdc-slide-toggle-1-label" aria-checked="true">...</button>
```

is being covered by another element:

```
<div class="mdc-switch__ripple">...</div>
```

Fix this problem, or use {force: true} to disable error checking. [Learn more](#)

src/e2e/init.cy.ts:4:41

```
2 | cy.visit('');
3 | // cy.get('a').should('have.attr', 'href').contains('Cus
> 4 | cy.get('button[role=switch]').first().click();
    |                                     ^
5 | cy.get('[data-testid=btn-click]') // Query
6 | .click() // Action
7 | .should('have.text', 'Unclick me'); // Assertion
```

> View stack trace

Print to console