



 **TestCon**

Spot the difference

**Automating visual
regression testing**



 **TestCon**

Spot the difference

**Automating visual
regression testing**



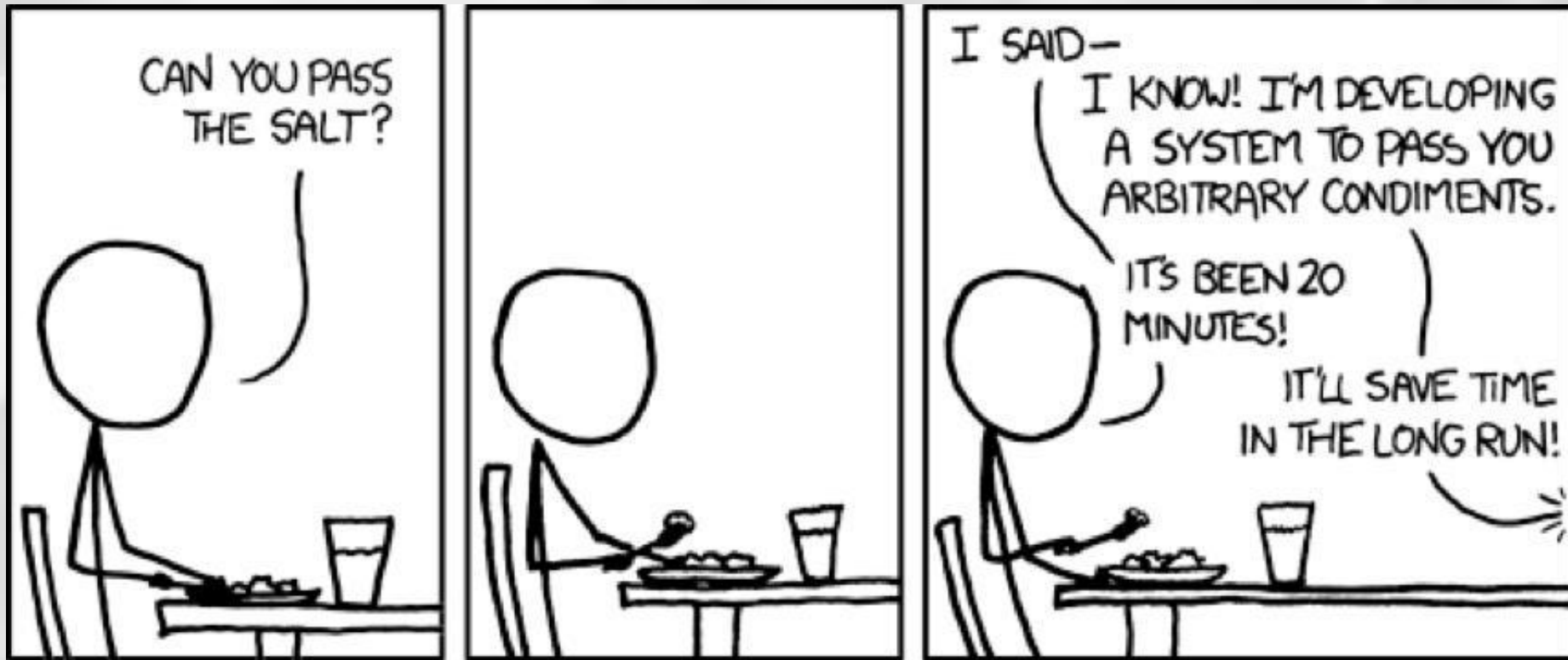
WHY AUTOMATE END TO END UI TESTS?

- Automated testing is more reliable, as it is performed by tools and/or scripts.
- Automated testing is executed by software tools, so it is significantly faster than a manual approach.

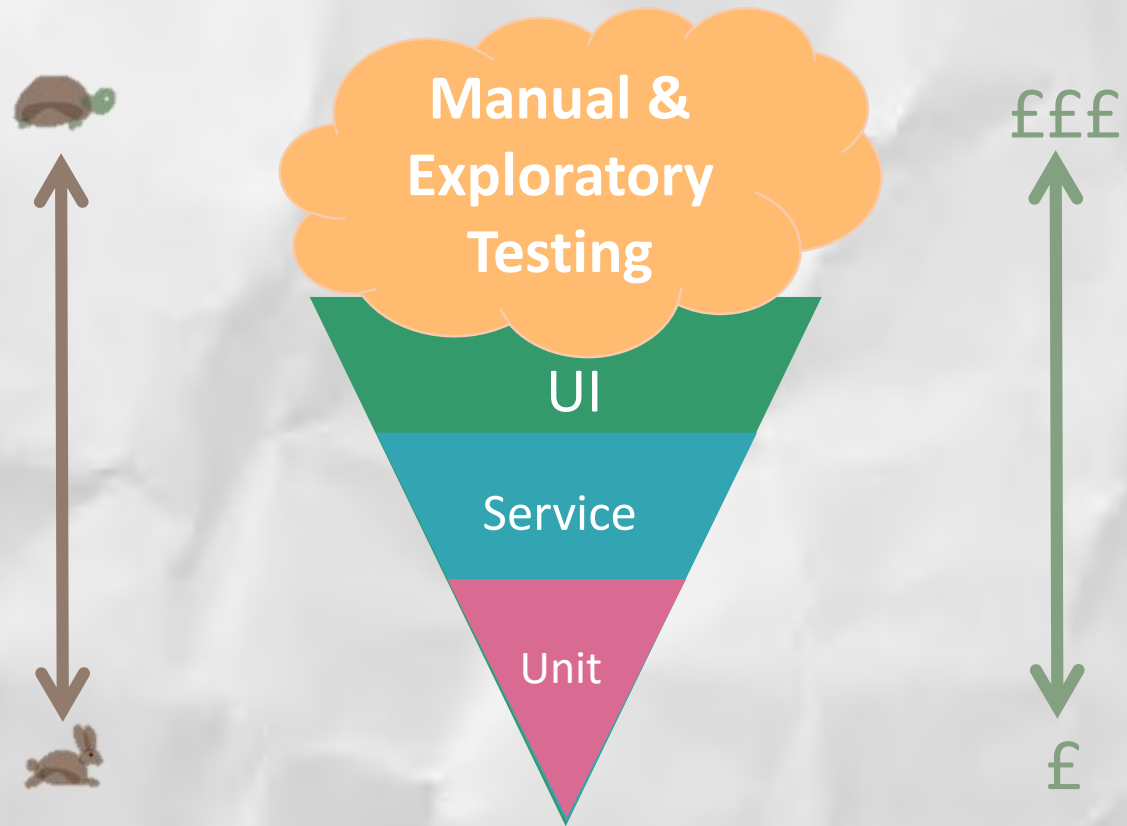


COMMON UI AUTOMATION ISSUES

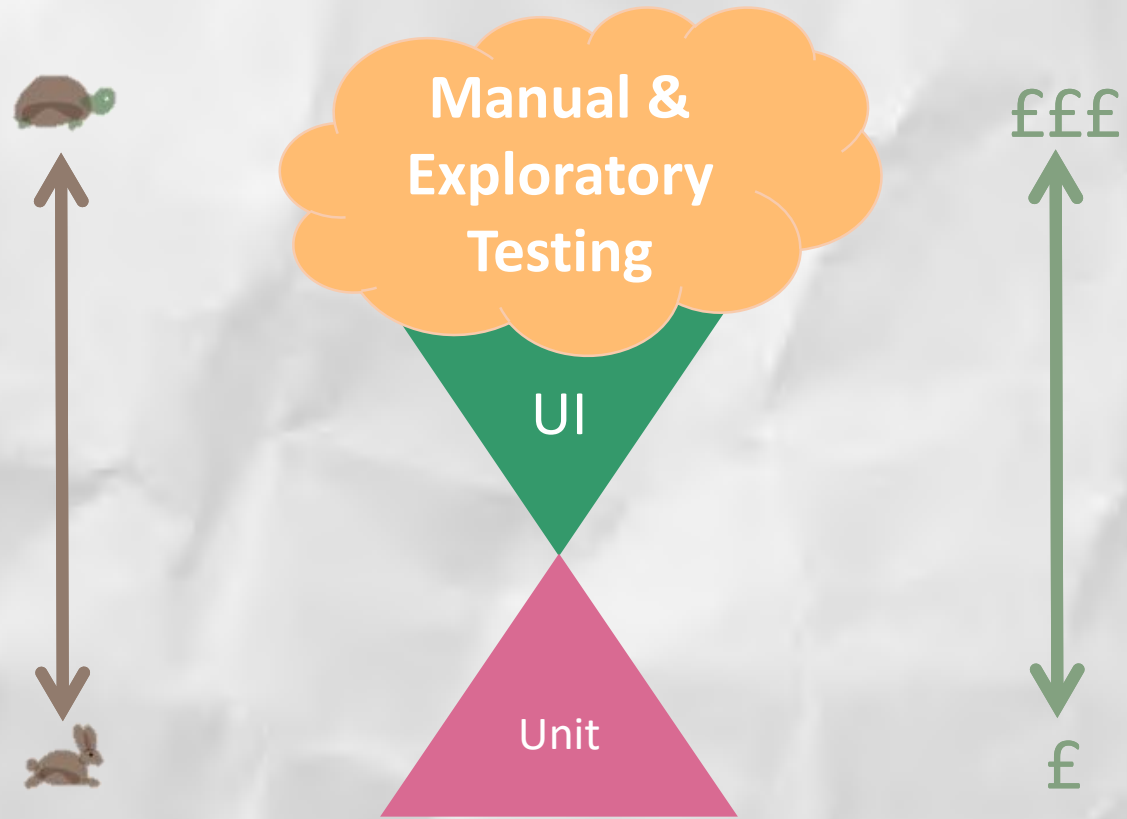
- Investment is required
- Automated testing is a practical option when the test cases are run repeatedly over a long time period.
- Automated testing **DOES NOT** entail human observation and cannot guarantee user-friendliness or positive customer experience.



IT CAN BE A SLIPPERY SLOPE



ICE-CREAM CONE ANTI-PATTERN



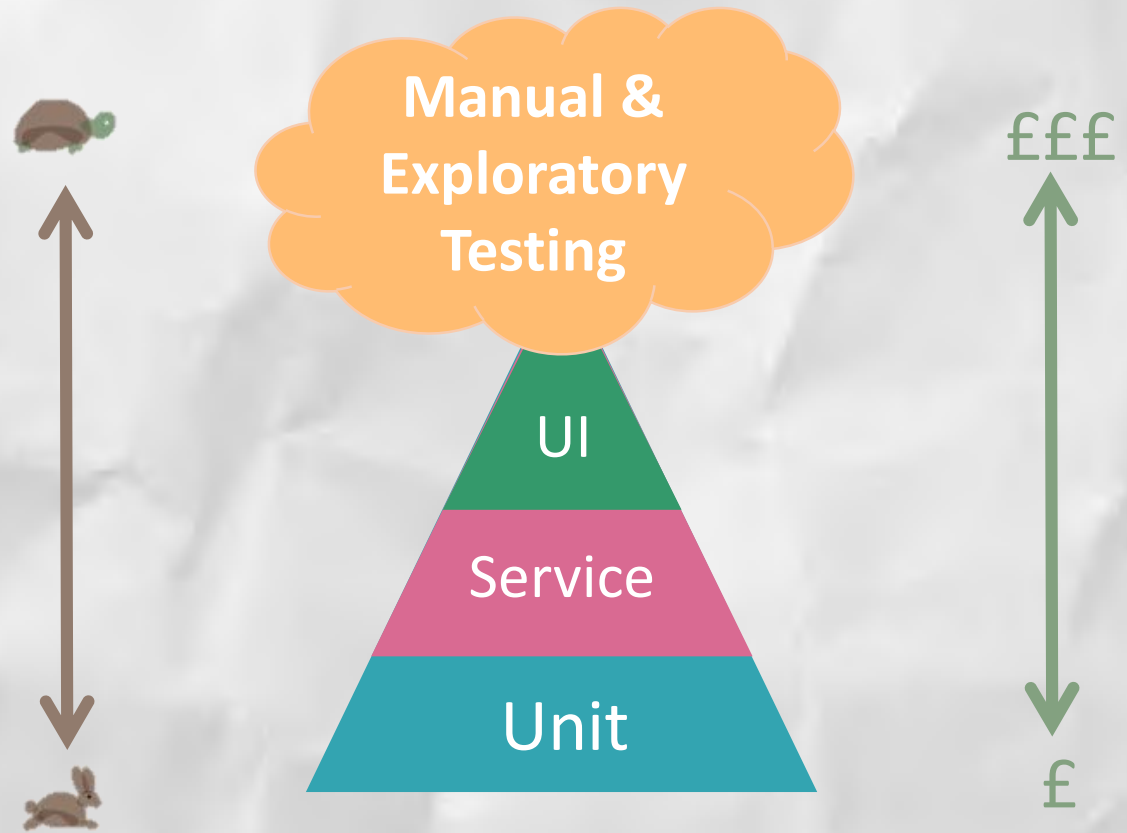
HOUR GLASS ANTI-PATTERN



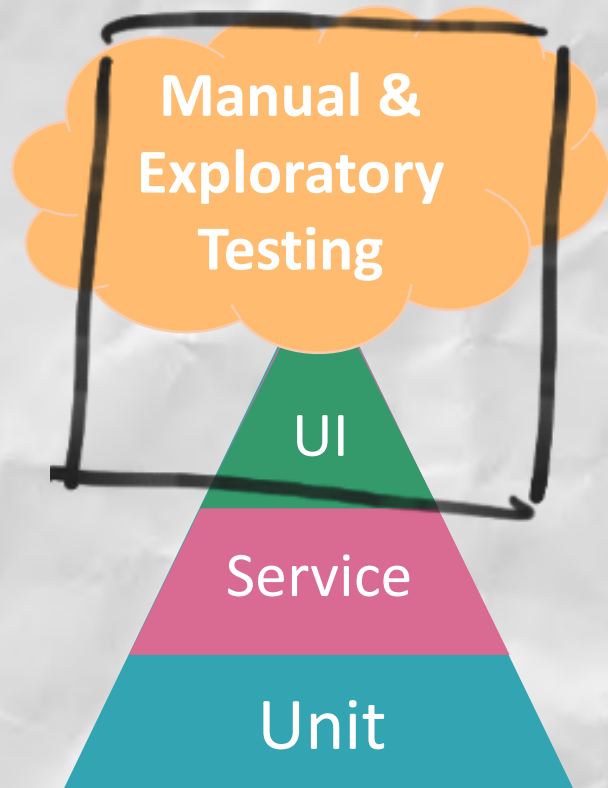
**WHEN YOU HAVE
UNIT BUT NO
INTEGRATION TESTS**

frAgile TESTING





TESTING PYRAMID



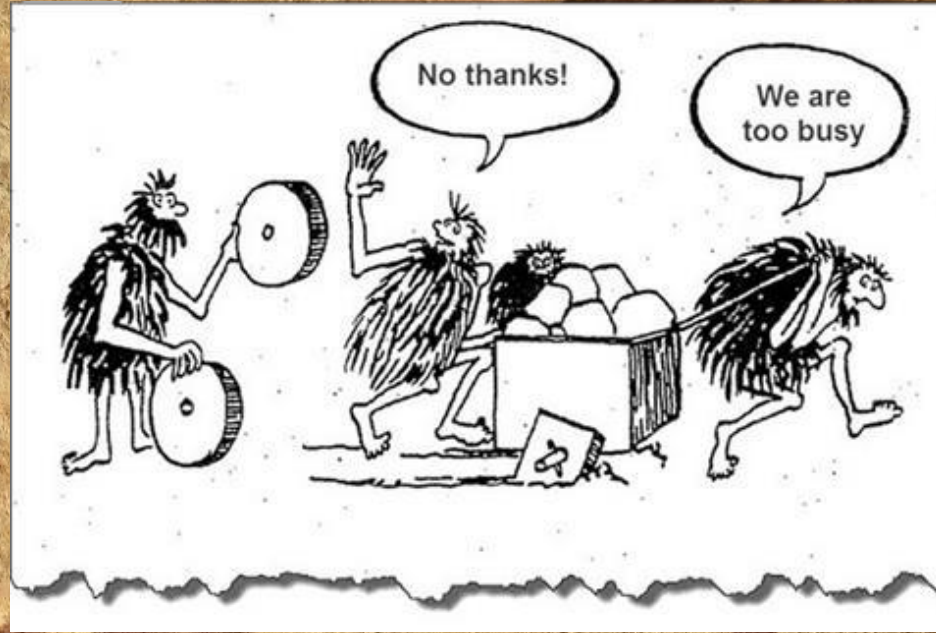
WHY NOT JUST STICK WITH MANUAL TESTING THEN?

- Manual testing allows for human observation, which may be more useful if the goal is user-friendliness or improved customer experience.

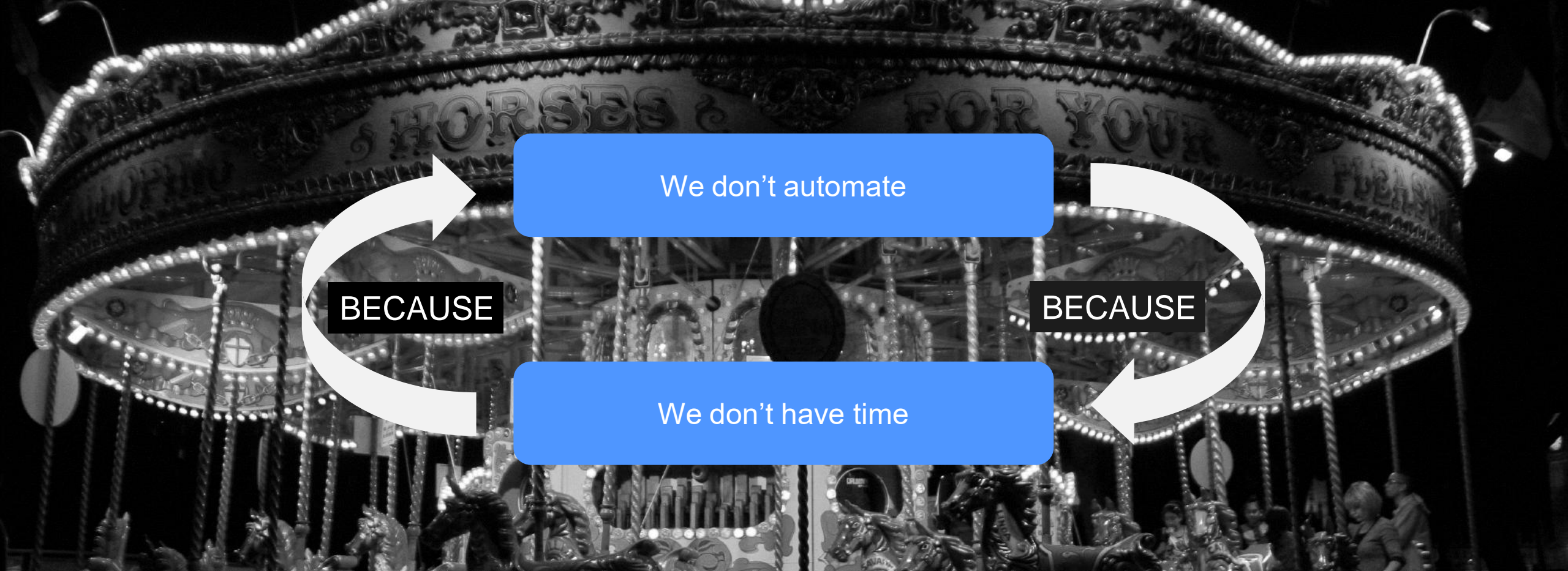


MANUAL TESTING

- Can be time intensive
- Is not accurate at all times due to human error, hence it is less reliable.
- Is time-consuming, taking up human resources.
- Is only practical when the test cases are run once or twice, and frequent repetition is not required.



WE DON'T HAVE TIME TO AUTOMATE



CATCH 22

MANY OPTIONS

 Visual Studio[®]
Coded UI

 selenium
SELENIUM FOR ANDROID



Robotium

 Ranorex[®]

 appium


WEBDRIVER 

Telerik[®] Test Studio[®]
by  Progress

 APACHE
JMeter


TestingWhiz

 TestComplete

 watir



SELENIUM

- Open source; anybody can see the code and help
- Big community of support
- Can operate on almost any OS
- Multiple language support (Python, Ruby, **.Net**, PHP, Java, JavaScript)
- Supports a range of browsers like Opera, **Chrome**, **IE** (6,7,8,9,10,11), **Mozilla Firefox**, Safari

IT'S NOT A SILVER BULLET





BROWSER COMPATIBILITY ISSUES

- Speed to execute tests
- Render differently



EXECUTION SPEED

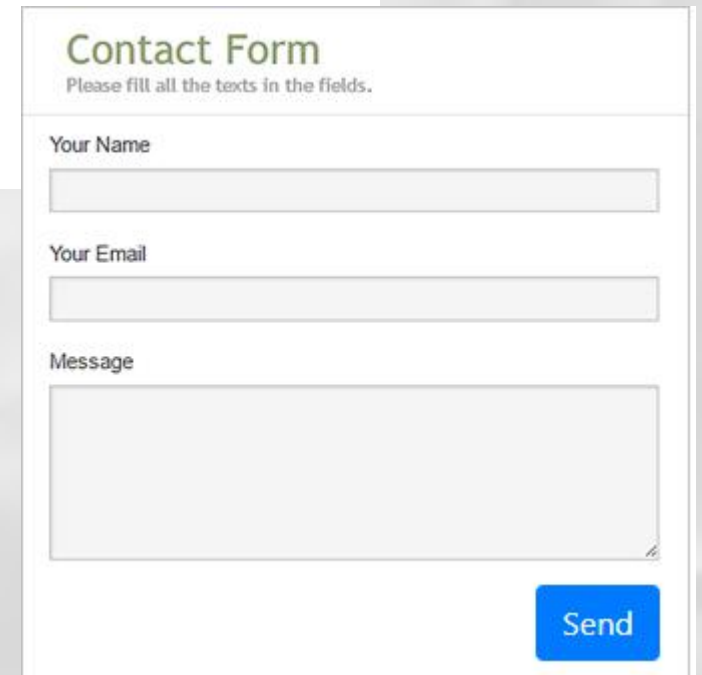
MAINTAINABILITY



HOW VALUABLE ARE THESE TESTS?

```
// Assert text on form is as expected
Assert.IsTrue(Driver.FindElement(By.CssSelector("h1")).Text.Contains("Contact Form"));
Assert.IsTrue(Driver.FindElement(By.CssSelector("h1")).Text.Contains("Please fill all the texts in the fields.));
Assert.IsTrue(Driver.FindElement(By.Id("nameLabel")).Text.Equals("Your Name"));
Assert.IsTrue(Driver.FindElement(By.Id("emailLabel")).Text.Equals("Your Email"));
Assert.IsTrue(Driver.FindElement(By.Id("messageLabel")).Text.Equals("Message"));

// Assert button text is as expected
Assert.IsTrue(Driver.FindElement(By.Id("sendButton")).GetAttribute("value").Equals("Send"));
```



Contact Form
Please fill all the texts in the fields.

Your Name

Your Email

Message

WHAT THE....

```
// Assert text on form is as expected
✓ Assert.IsTrue(Driver.FindElement(By.CssSelector("h1")).Text.Contains("Contact Form"));
✓ Assert.IsTrue(Driver.FindElement(By.CssSelector("h1")).Text.Contains("Please fill all the texts in the fields.));
✓ Assert.IsTrue(Driver.FindElement(By.Id("nameLabel")).Text.Equals("Your Name"));
✓ Assert.IsTrue(Driver.FindElement(By.Id("emailLabel")).Text.Equals("Your Email"));
✓ Assert.IsTrue(Driver.FindElement(By.Id("messageLabel")).Text.Equals("Message"));

// Assert button text is as expected
✓ Assert.IsTrue(Driver.FindElement(By.Id("sendButton")).GetAttribute("value").Equals("Send"));
```

Contact Form

Please fill all the texts in the fields.

Your Name

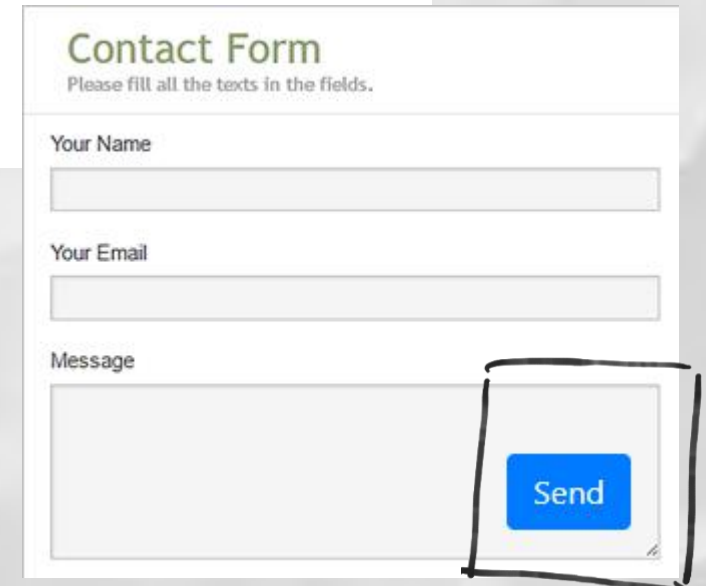
Your Email

Message

ALL IS NOT WHAT IT SEEMS

```
// Assert text on form is as expected
✓ Assert.IsTrue(Driver.FindElement(By.CssSelector("h1")).Text.Contains("Contact Form"));
✓ Assert.IsTrue(Driver.FindElement(By.CssSelector("h1")).Text.Contains("Please fill all the texts in the fields.));
✓ Assert.IsTrue(Driver.FindElement(By.Id("nameLabel")).Text.Equals("Your Name"));
✓ Assert.IsTrue(Driver.FindElement(By.Id("emailLabel")).Text.Equals("Your Email"));
✓ Assert.IsTrue(Driver.FindElement(By.Id("messageLabel")).Text.Equals("Message"));

// Assert button text is as expected
✓ Assert.IsTrue(Driver.FindElement(By.Id("sendButton")).GetAttribute("value").Equals("Send"));
```



The screenshot shows a web form titled "Contact Form" with the instruction "Please fill all the texts in the fields." Below the instruction are three input fields: "Your Name", "Your Email", and "Message". At the bottom right of the form is a blue "Send" button. A hand-drawn black box highlights the "Send" button.



MAKING TESTS LESS FLAKY



MAKING TESTS LESS FLAKY

- Page object patterns

<http://martinfowler.com/bliki/PageObject.html>



MAKING TESTS LESS FLAKY

- Qa-selectors

Qa- selectors

```
<label for="fname">Your Name</label>
<input type="text" id="fname" name="name">

<label for="lemail">Your Email</label>
<input type="text" id="lemail" name="email">

<label for="message">Message</label>
<textarea id="lmessage" name="message"></textarea>

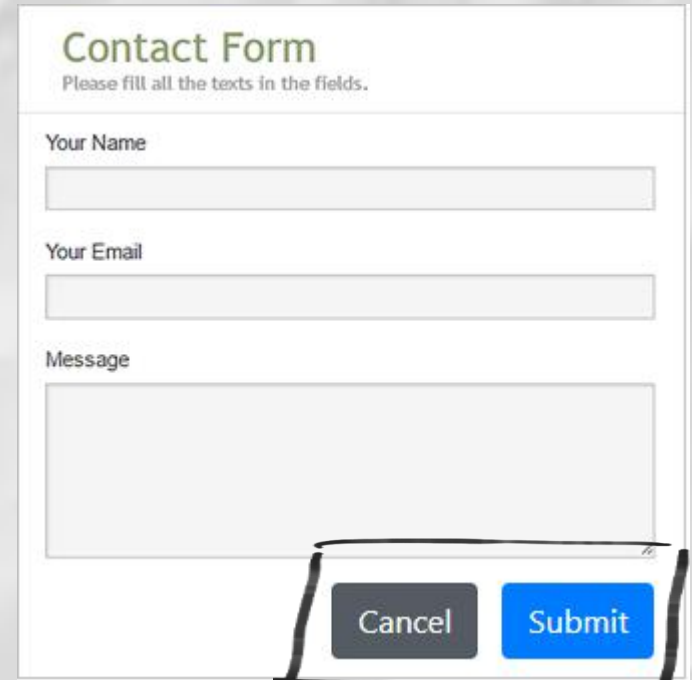
<input type="button" class="button" value="Cancel">
<input type="submit" class="button" value="Submit">
```

```
<label for="fname">Your Name</label>
<input type="text" id="fname" name="name">

<label for="lemail">Your Email</label>
<input type="text" id="lemail" name="email">

<label for="message">Message</label>
<textarea id="lmessage" name="message"></textarea>

<input type="button" class="qa-button-cancel" value="Cancel">
<input type="submit" class="qa-button-submit" value="Submit">
```



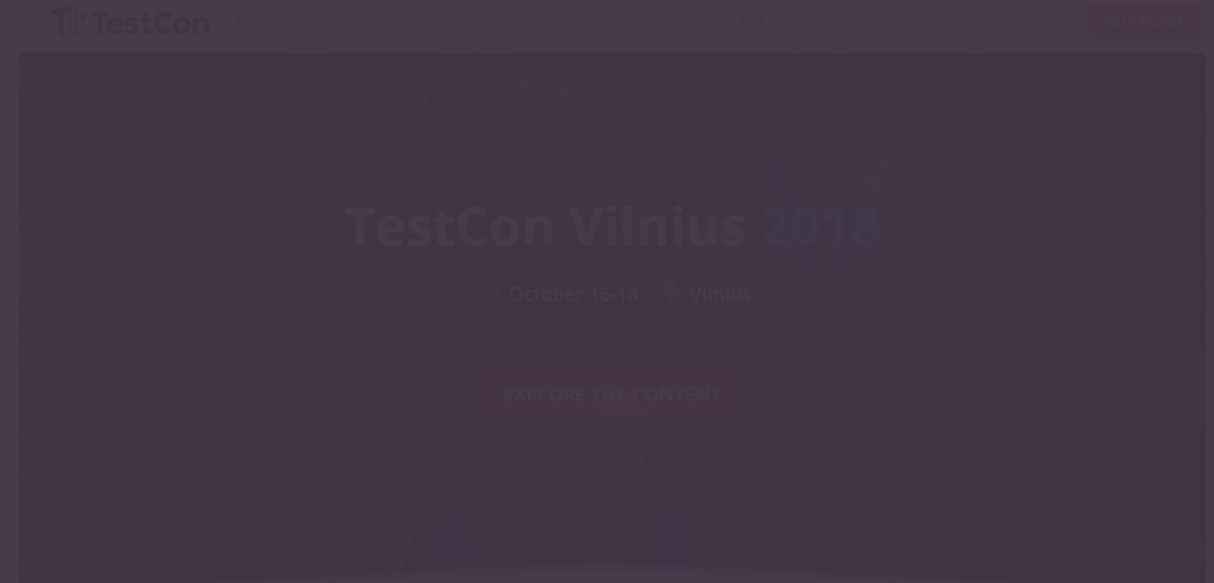
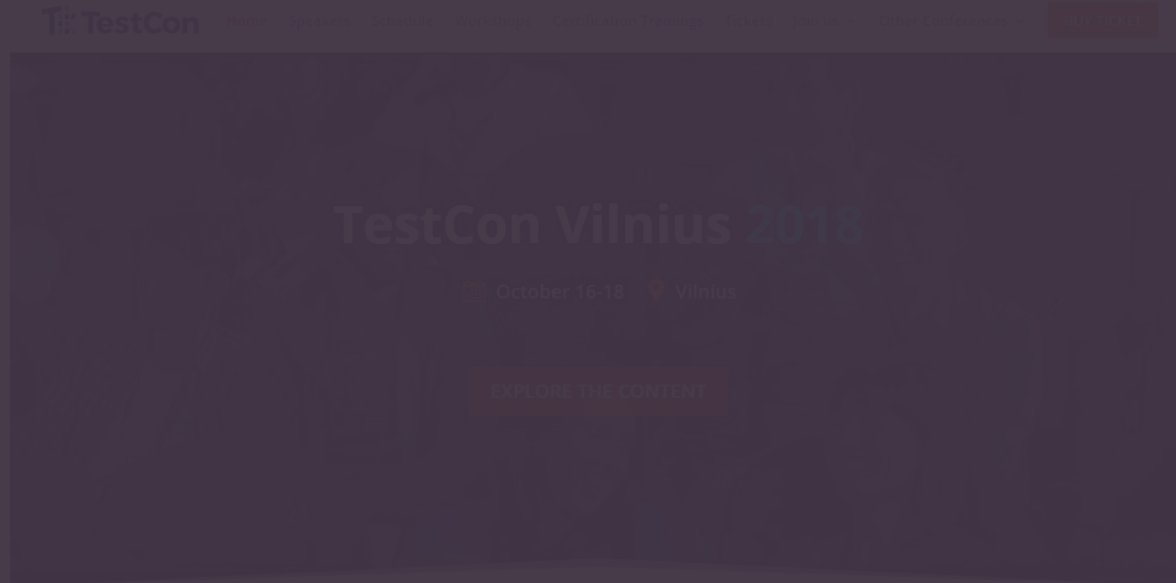
Contact Form
Please fill all the texts in the fields.

Your Name

Your Email

Message

HOW GOOD ARE YOU AT SPOT THE DIFFERENCE



TOP CREATIVE MINDS IN ONE PLACE

TestCon Vilnius is the leading conference for everyone willing to learn testing trends, best practices and make their contribution to the smoother software development cycle and quality.

The event provides an excellent platform to keep up-to-date with the latest industry trends, exchange experiences, discuss and

TESTCON VILNIUS STARTS IN:

02 : 19 : 59 : 01

Days Hours Minutes Seconds

RESERVE YOUR SEAT

TOP CREATIVE MINDS IN ONE PLACE

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TESTCON VILNIUS STARTS IN:

02 : 19 : 55 : 01

Days Hours Minutes Seconds

RESERVE YOUR SEAT

HOW MANY DIFFERENCES CAN YOU FIND?



TOP CREATIVE MINDS IN ONE PLACE

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TESTCON VILNIUS STARTS IN:

02 : 19 : 59 : 01
Day(s) Hour(s) Minute(s) Second(s)

RESERVE YOUR SEAT

Got it Read more



TOP CREATIVE MINDS IN ONE PLACE

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The event provides an excellent platform to keep up-to-date with the latest industry trends, exchange experiences, discuss and

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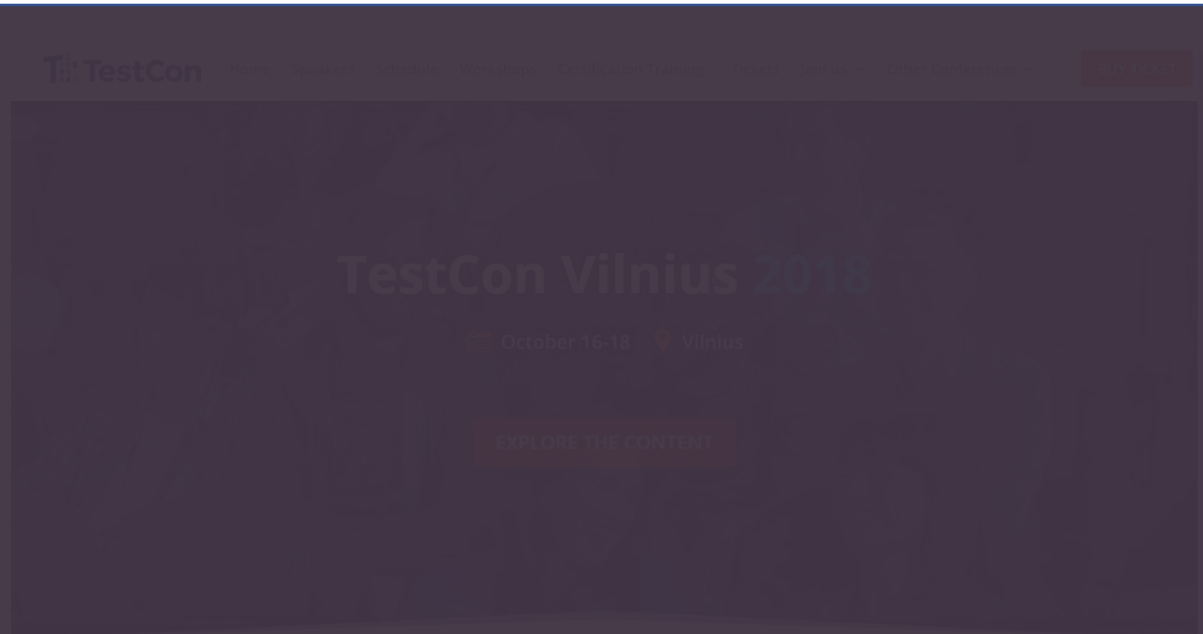
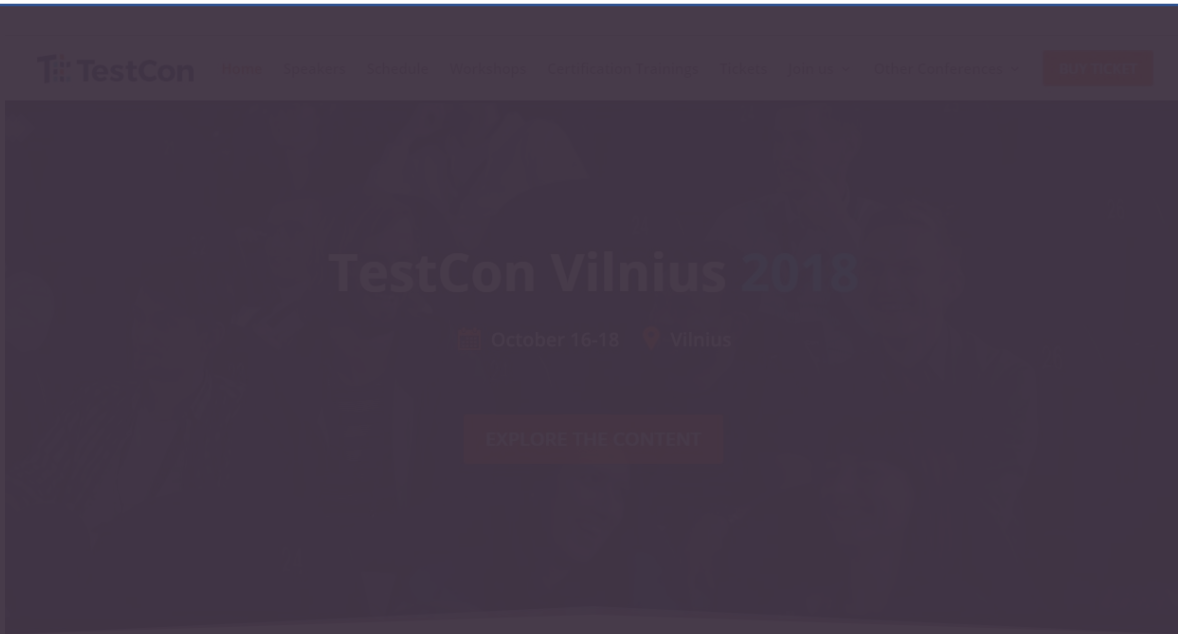
TESTCON VILNIUS STARTS IN:

02 : 19 : 55 : 01
Day(s) Hour(s) Minute(s) Second(s)

RESERVE YOUR SEAT

Read more

HOW MANY DIFFERENCES DID YOU FIND?



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network to build an ecosystem that will give you the best experience on our website. If you purchase a ticket for the event you will receive that you are happy with it.

TESTCON VILNIUS STARTS IN:

02 : 19 : 59 : 01

Days Hours Minutes Seconds

RESERVE YOUR SEAT

TOP CREATIVE MINDS IN ONE PLACE

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The event provides an excellent platform to keep up-to-date with the latest industry trends, exchange experiences, discuss and

network to build an ecosystem that will give you the best experience on our website. If you purchase a ticket for the event you will receive that you are happy with it.

TESTCON VILNIUS STARTS IN:

02 : 19 : 55 : 01

Days Hours Minutes Seconds

RESERVE YOUR SEAT

THERE WERE 11 DIFFERENCES



TOP CREATIVE MINDS IN ONE PLACE

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TESTCON VILNIUS STARTS IN:

02 : 19 : 59 : 01
Day(s) Hour(s) Minute(s) Second(s)

[RESERVE YOUR SEAT](#)



TOP CREATIVE MINDS IN ONE PLACE

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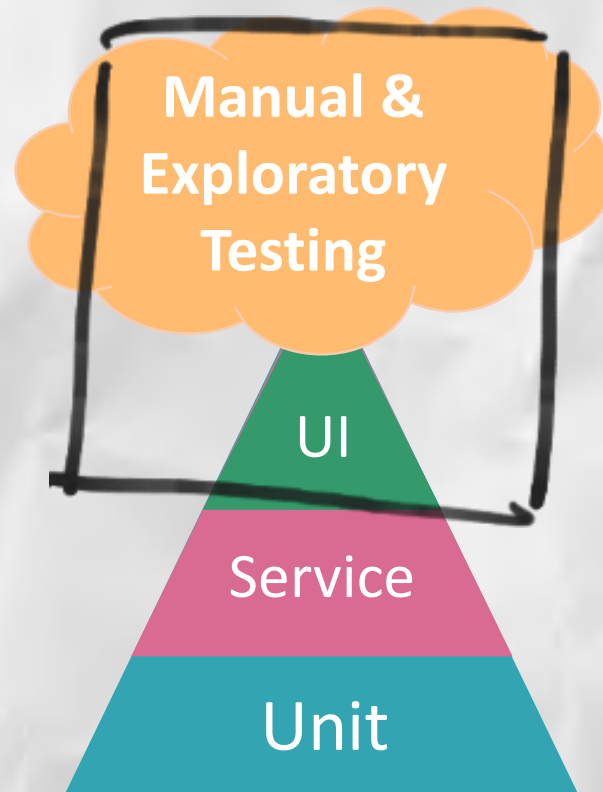
TESTCON VILNIUS STARTS IN:

02 : 19 : 55 : 01
Day(s) Hour(s) Minute(s) Second(s)

[RESERVE YOUR SEAT](#)

**HOW DO YOU KNOW WHEN YOU'VE
FOUND THEM ALL?**





CAN WE ADD MORE VALUE TO OUR TESTS?

WHAT IF WE COULD SIMPLY

Assert

The screenshot shows the TestCon website homepage for Vilnius 2018. The navigation bar includes links for Home, Speakers, Schedule, Workshops, Certification Trainings, Tickets, Join us, and Other Conferences, along with a BUY TICKET button. The main banner features the event title "TestCon Vilnius 2018" and dates "October 16-18" in Vilnius, with an EXPLORE THE CONTENT button. Below the banner, there is a section titled "TOP CREATIVE MINDS IN ONE PLACE" with a description of the conference. To the right, a "TESTCON VILNIUS STARTS IN:" timer displays "02 : 19 : 59 : 01" (Days, Hours, Minutes, Seconds) and a RESERVE YOUR SEAT button. A small cookie notice is visible at the bottom.

equals

This screenshot is identical to the one on the left, but the timer in the "TESTCON VILNIUS STARTS IN:" section now displays "02 : 19 : 55 : 01". This represents a change in the time remaining for the event.

VISUAL TESTING



SCREENSTER

BackstopJS



PhantomCSS



WRAITH



Ghost Inspector



applitools

AI powered Visual Testing & Monitoring



@11v1r



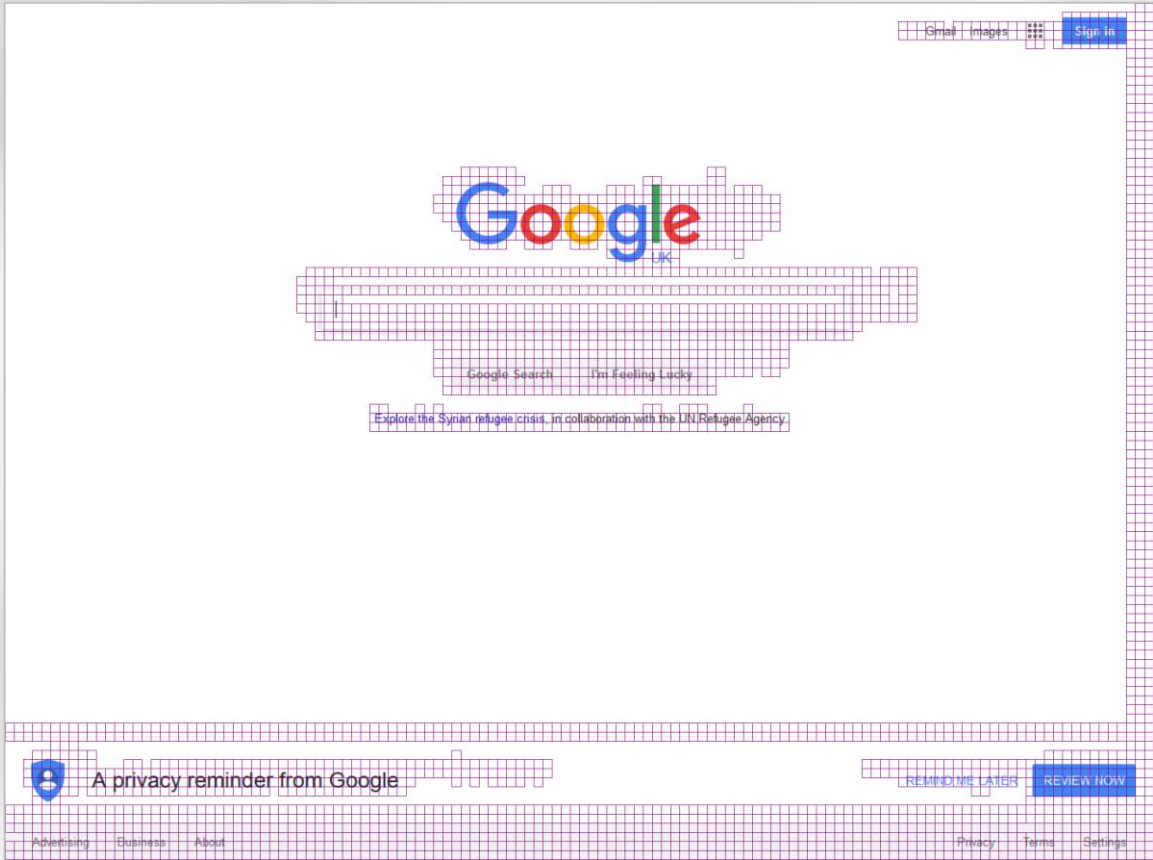
ISSUES WITH OTHER OFFERINGS

- Didn't work straight out of the box and/or contained lots of bloat
- Steep learning curve
- Small community so lack of support
- Needed to work with our current automation framework
- Costs



ROLLING OUR OWN

- Been in development 1 year
- Facing many challenges which are because of the products we offer, the ways in which we have developed them and the way in which we test them



RELIABILITY

- Browser rendering issues

Run All | Run... | Playlist: All Tests

ExecutionSpeed (1)
GooglePageShouldLookAsExpectedTest
No Traits (9)

Summary
Last Test Run Passed (Total Run Time 0:00:04)
1 Test Passed

```
102 [TestCategory("ExecutionSpeed")]
103 [TestMethod]
104 public void GooglePageShouldLookAsExpectedTest()
105 {
106     //Arrange
107     String image = "Google.png";
108     Uri url = new Uri("http://www.google.co.uk");
109
110
111     //Act
112     int difference = ImageTool.GetDifference(image, url);
113
114     //Assert
115     Assert.IsTrue(difference == 0); // do not allow any difference
116 }
117
118 }
119
```

100 %

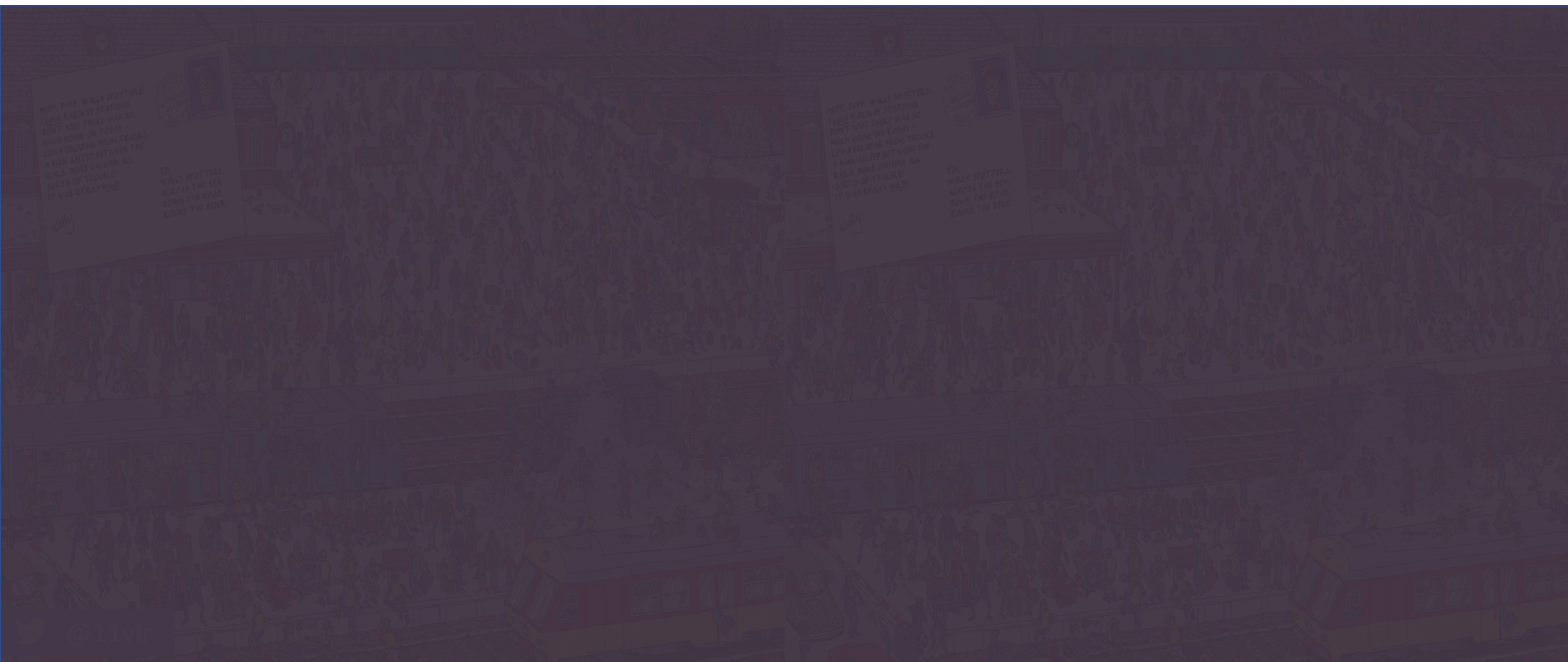
Output

Show output from: Build

```
1>----- Rebuild All started: Project: AutomatedVisualTesting, Con
1>C:\Dev\AutomatedVisualTesting-master\ImageTool.cs(276,9,276,49):
1> AutomatedVisualTesting -> C:\Dev\AutomatedVisualTesting-master\
===== Rebuild All: 1 succeeded, 0 failed, 0 skipped =====
```

EXECUTION SPEED

HUMAN VS MACHINE



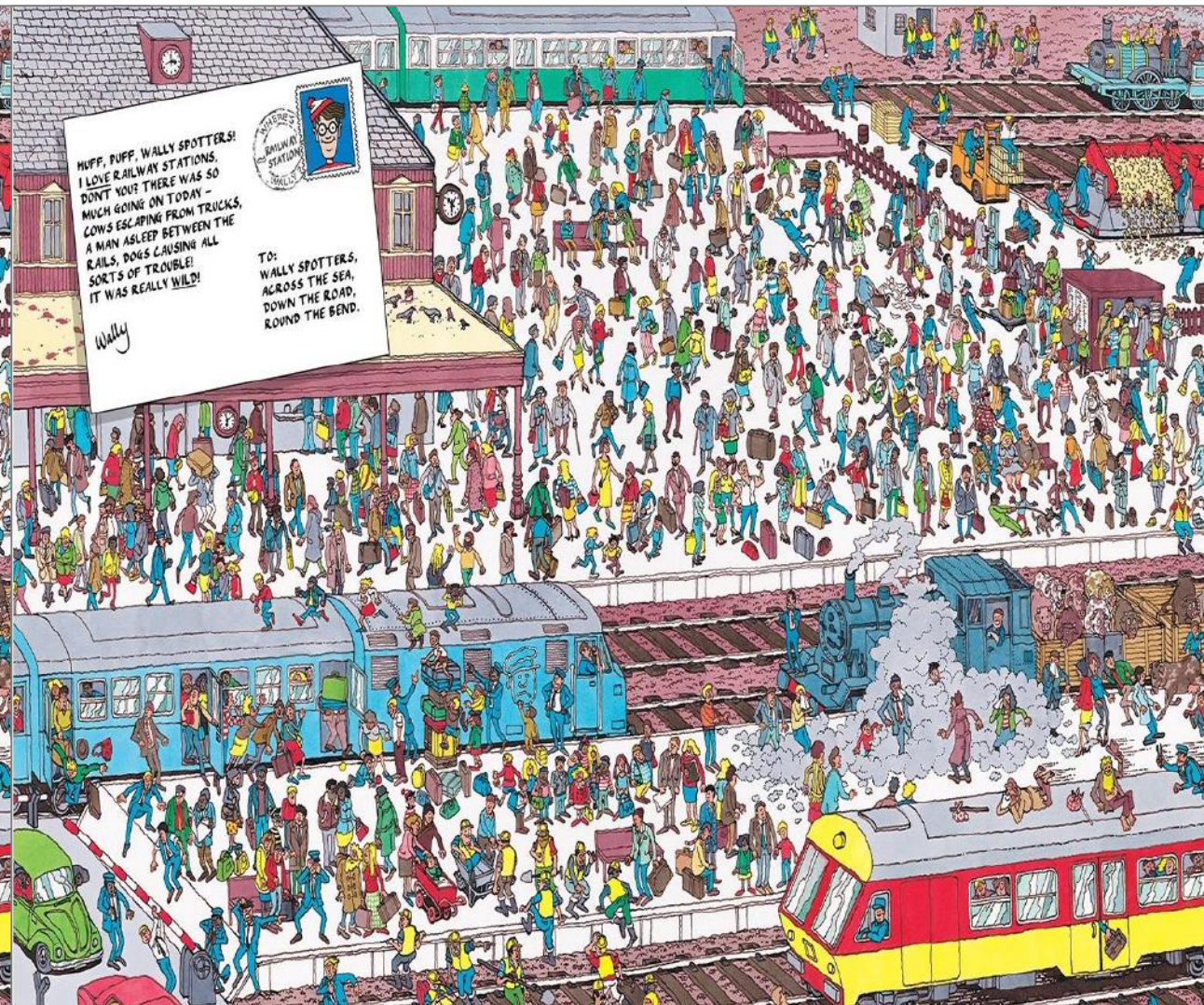
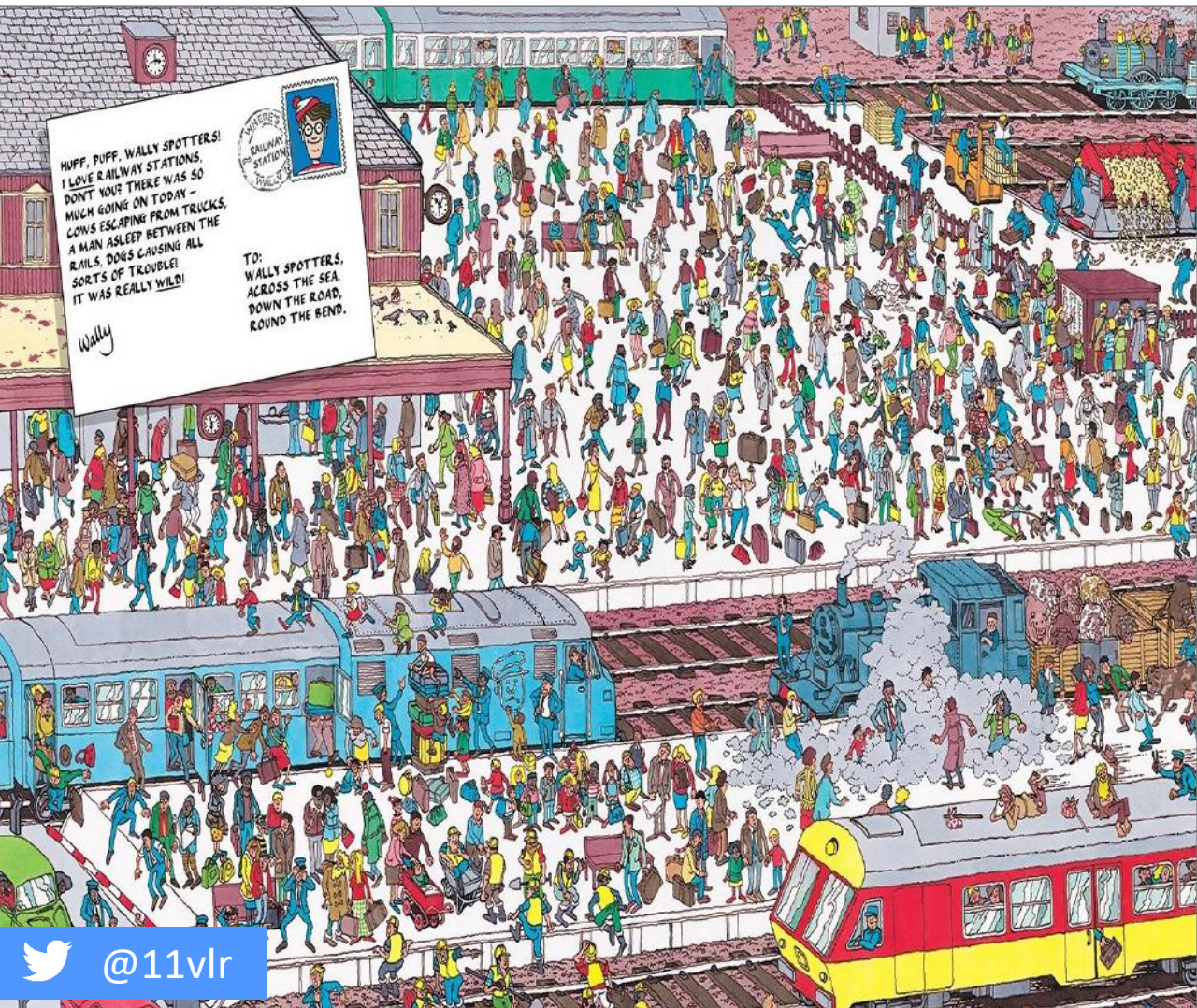
HIPPY FIVE, WHILY SPOTTLED
I LOVE RAILWAY STATIONS
DON'T YOU? THERE WAS SO
MUCH GOING ON THEN -
KINDS OF WOMEN FROM TOWN,
A MAN CALLED BETWIXT THE
EARS, SOME CAUSING ALL
SORTS OF TROUBLE,
IT WAS REALLY NICE!

TO
WHILY SPOTTLED
ACROSS THE SEA
TOWNS THE ROAD
ALONG THE BEND

HIPPY FIVE, WHILY SPOTTLED
I LOVE RAILWAY STATIONS
DON'T YOU? THERE WAS SO
MUCH GOING ON THEN -
KINDS OF WOMEN FROM TOWN,
A MAN CALLED BETWIXT THE
EARS, SOME CAUSING ALL
SORTS OF TROUBLE,
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TO
WHILY SPOTTLED
ACROSS THE SEA
TOWNS THE ROAD
ALONG THE BEND

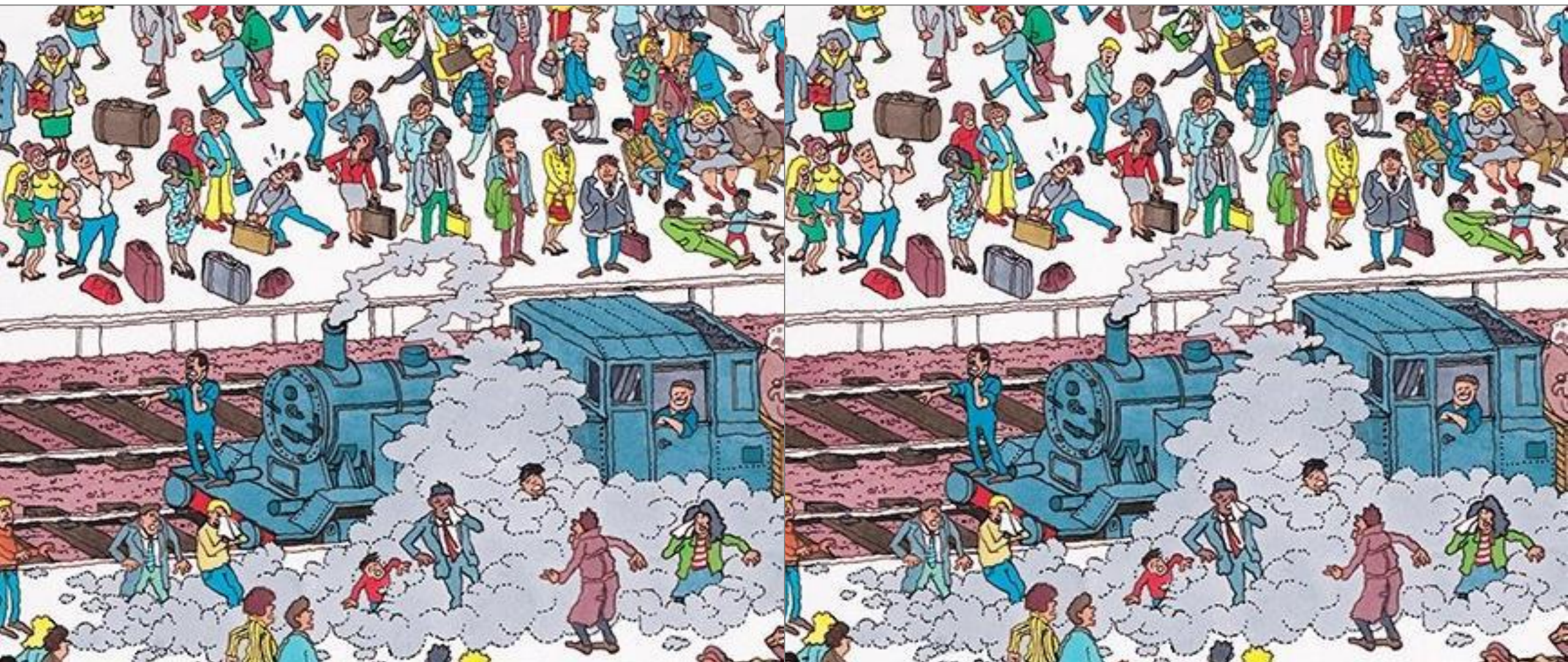
HUMAN VS MACHINE



LETS ZOOM IN A LITTLE



LETS ZOOM IN A LITTLE BIT MORE...



GOT HIM!



HOW QUICK WAS THE MACHINE?

Failed Tests (1)

✖ TestCheckImagesAreTheSame 293 ms

TestCheckImagesAreTheSame

Source: Tests.cs line 34

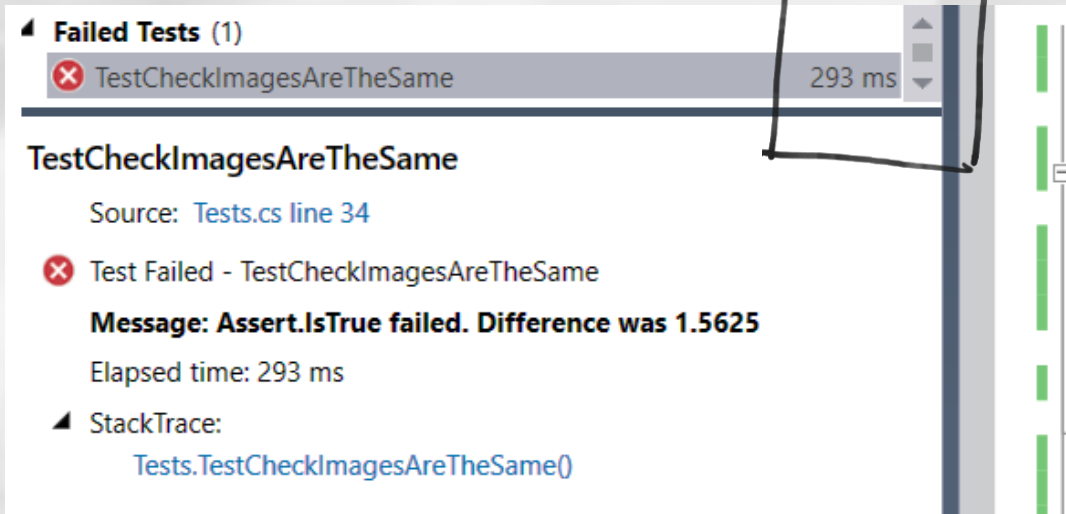
✖ Test Failed - TestCheckImagesAreTheSame

Message: Assert.IsTrue failed. Difference was 1.5625

Elapsed time: 293 ms

Stack Trace:

Tests.TestCheckImagesAreTheSame()



```
String imageWithWally = "Wally.png";  
String imageWithNoWally = "NoWally.png";  
  
int difference = GetDifference(imageWithWally, imageWithNoWally);  
  
Assert.IsTrue(difference == 0);
```



MAINTAINABILITY

Old code

```
// Assert text on form is as expected
Assert.IsTrue(Driver.FindElement(By.CssSelector("h1")).Text.Contains("Contact Form"));
Assert.IsTrue(Driver.FindElement(By.CssSelector("h1")).Text.Contains("Please fill all the texts in the fields.));
Assert.IsTrue(Driver.FindElement(By.Id("nameLabel")).Text.Equals("Your Name"));
Assert.IsTrue(Driver.FindElement(By.Id("emailLabel")).Text.Equals("Your Email"));
Assert.IsTrue(Driver.FindElement(By.Id("messageLabel")).Text.Equals("Message"));

// Assert button text is as expected
Assert.IsTrue(Driver.FindElement(By.Id("sendButton")).GetAttribute("value").Equals("Send"));
```

Contact Form

Please fill all the texts in the fields.

Your Name

Your Email

Message

Send

MAINTAINABILITY

Old code

```
// Assert text on form is as expected
Assert.IsTrue(Driver.FindElement(By.CssSelector("h1")).Text.Contains("Contact Form"));
Assert.IsTrue(Driver.FindElement(By.CssSelector("h1")).Text.Contains("Please fill all the texts in the fields.));
Assert.IsTrue(Driver.FindElement(By.Id("nameLabel")).Text.Equals("Your Name"));
Assert.IsTrue(Driver.FindElement(By.Id("emailLabel")).Text.Equals("Your Email"));
Assert.IsTrue(Driver.FindElement(By.Id("messageLabel")).Text.Equals("Message"));

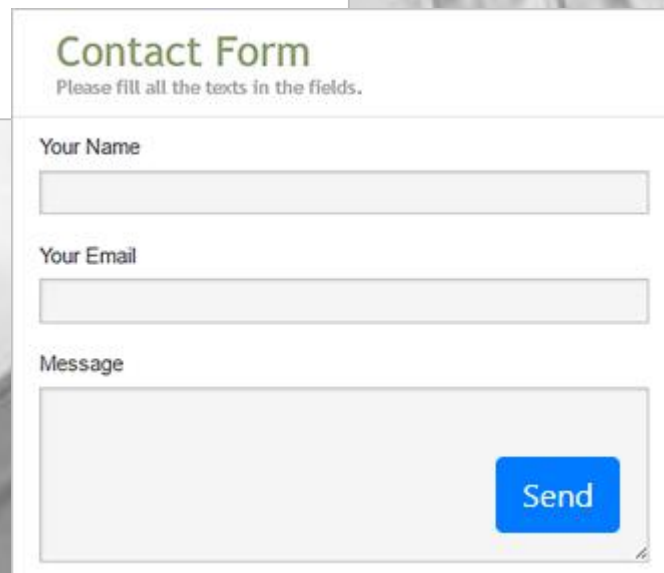
// Assert button text is as expected
Assert.IsTrue(Driver.FindElement(By.Id("sendButton")).GetAttribute("value").Equals("Send"));
```

New code using some helpers

```
//Arrange
String image = "ContactPage.png";
Uri url = new Uri("http://www.mypage.co.uk/contact-form");

//Act
int difference = GetDifference(image, url);

//Assert
Assert.IsTrue(difference == 0); // do not allow any difference
```



Contact Form
Please fill all the texts in the fields.

Your Name

Your Email

Message

New code using Specflow

```
@PageComparison
Scenario: home page is rendered as expected
    When the url 'www.homepage.co.uk' is visited
    Then the page should match the 'HomePage.png' base image

@PageComparison
Scenario: contact page is rendered as expected
    When the url 'www.homepage.co.uk/contact' is visited
    Then the page should match the 'Contact.png' base image
```

```
[When(@"the url '(.)' is visited")]
public void WhenTheURLIsVisited(string url)
{
    //Navigate to the given url
    Driver.Navigate().GoToUrl(url);
}

[Then(@"the page should match the '(.)' base image")]
public void ThenThePageShouldMatchTheBaseImage(string baseImage)
{
    //Get Image of currently loaded web page
    Image imageFromCurrentPage = GetCurrentPageAsImage();

    //Check for differences
    int difference = GetDifference(baseImage, imageFromCurrentPage);

    //assert no differences found
    Assert.IsTrue(difference == 0);
}
```

MAINTAINABILITY

New code using some helpers

```
//Arrange
String image = "ContactPage.png";
Uri url = new Uri("http://www.mypage.co.uk/contact-form");

//Act
int difference = GetDifference(image, url);

//Assert
Assert.IsTrue(difference == 0); // do not allow any difference
```

Contact Form

Please fill all the texts in the fields.

Your Name

Your Email

Message

ACCURACY

Create a Meetup

Login

Sign-up



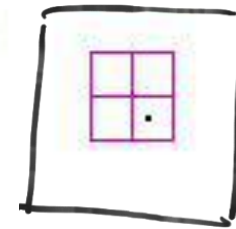
Pembrokeshire Software Development Community

Location:

Pembroke Dock, United Kingdom

Members

272



Organisers

Elliot W. and 1 other

Join us

...



@11v1r

IMAGE QUALITY DIFFERENCE



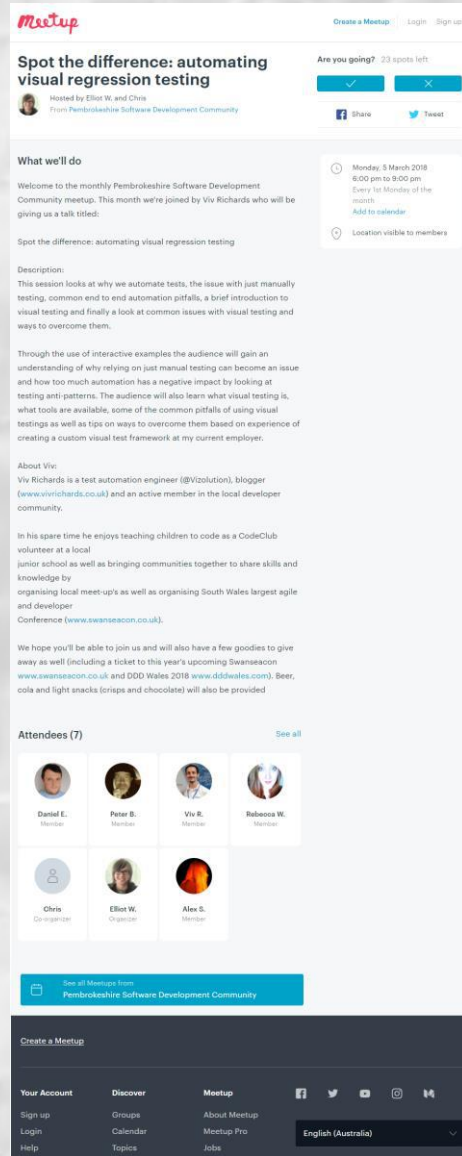
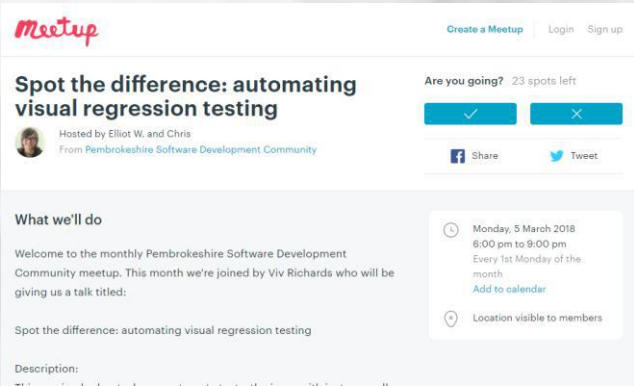
CHALLENGES SO FAR





MAINTAINING BASE IMAGES

Keep a base image for each driver type



SCREENSHOTS

- Viewport (default - WebDriver W3C standard)
- Full Screen (stitching)
- Capture images of just elements

SCREEN RESOLUTIONS



SCREEN RESOLUTIONS



Responsive design





STORAGE

Database / Online storage – file sizes (many images)

DYNAMIC CONTENT

Next Meetup

[See all](#)

22
MAY

Tuesday, 22 May 2018, 6:30 pm

#10 South West Test



Hosted by Danny

I'm very pleased to announce the next South West Test event, This event has been made possible by the wonderful folks at Scott Logic (<https://www.scottlogic.com/>). Their continued support of this local meetup is very much appreciated. We have an awesome main talk for you all by Viv Richards. He'll be sharing his knowledge and experiences around visual regression testing - This is a very interesting talk and has been well received at a...



You + 59 going



Scott Logic

25 King St, Bristol · BS1 4PB



17 comments

What we're about

This meetup group is for people in and around the Bristol area, interested in all things testing. Engineers (be that Testers, QAs, DITs or SDETs) of all skill levels are welcome to join and share their experiences and stories about good practices, test automation, test tools and techniques.

Come along learn, network and have a good time! We are a very friendly

[Read more](#)

Past Meetups (10)

[See all](#)

24
JAN.

Wed., 24 Jan. 2018, 6:30 pm

#9 South West Test: Isabel Evans



24 went

DYNAMIC CONTENT

The screenshot shows a Meetup event page for '#10 South West Test' on Tuesday, 22 May 2018, 6:30 pm, hosted by Danny at Scott Logic. A red box highlights the 'You + 59 going' link in the attendees section. A blue arrow points from this link to the code block below.

The screenshot shows the same Meetup event page. A blue arrow points from the 'You + 59 going' link in the attendees section to the code block below.

```
// Navigate to the web page
Driver.Navigate().GoToUrl("https://www.meetup.com/");

// cover dynamic attendees element
CoverDynamicElementBySelector("attendeesLink");
```

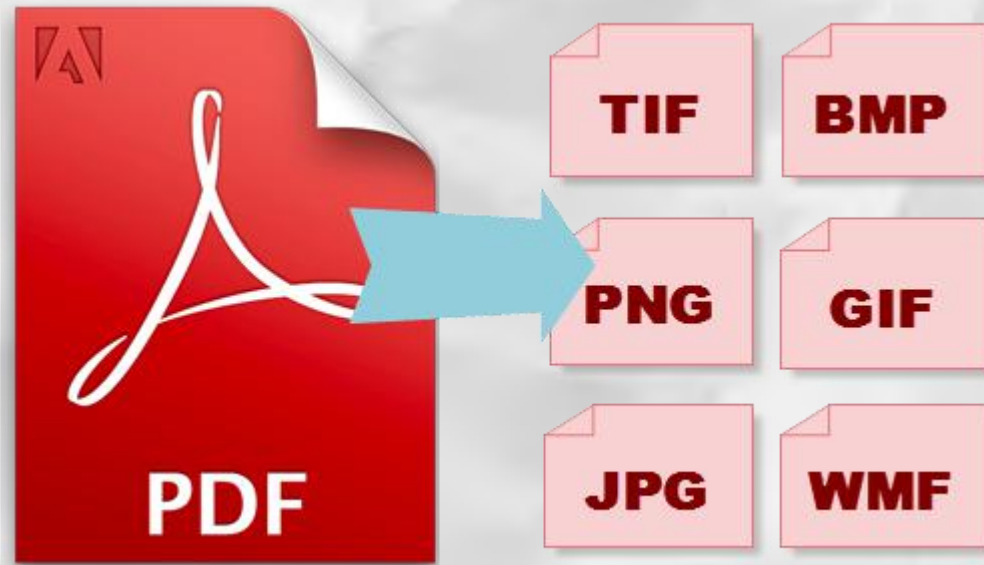
class="attendeesLink"

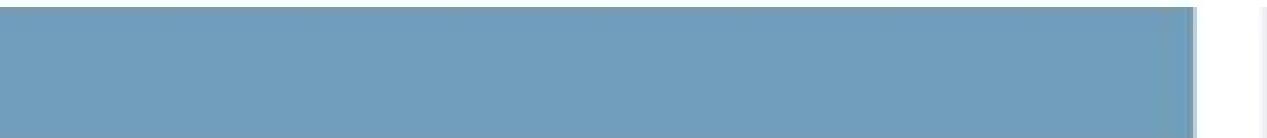


MOVING ELEMENTS

- CSS animations
- Videos

VISUALLY CHECKING DOCUMENTS





PDF DYNAMIC CONTENT

- A way to blanket content within documents



UPCOMING CHALLENGES





MORE COMPARISON OPTIONS

- Text only
- Layout only

ANOTHER TOOL TO ADD TO YOUR BELT





THANK YOU

Git repository: <http://bit.ly/VisualTesting>

NuGet.org Package:

```
PM> Install-Package AutomatedVisualTesting -Version 2.0.0
```

@11VLR

WWW.VIVRICHARDS.CO.UK