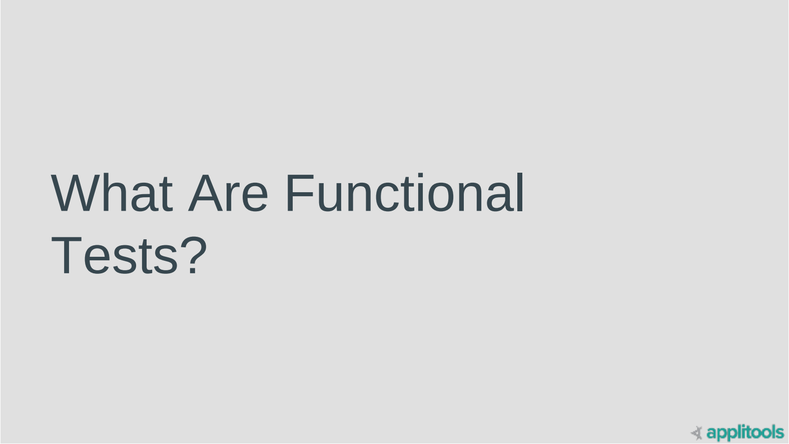
Spot the Difference: How Front-end and UI Bugs are Hurting You, Your Team and Your Company

•••

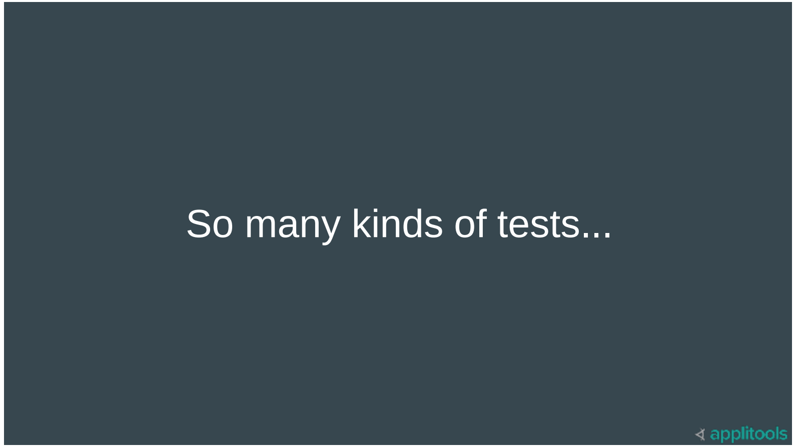
Eran Barlev (@eranbarlev)
March 2019

About Me

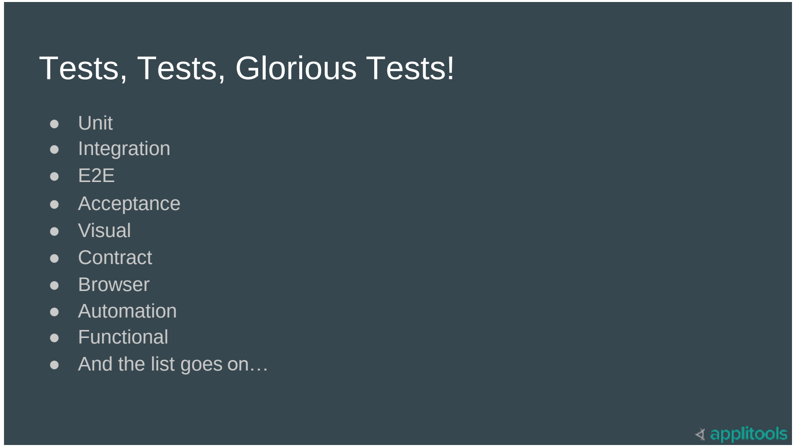
- Software Engineer at heart with over 20 years of experience.
- Currently Technical Solution Engineer @ Applitools
- Founder of the Canadian Software Testing Board
- My true passion is automation and being able to automate visual testing of web, app and desktop application makes my current position at Applitools a dream job



What Are Functional Tests?



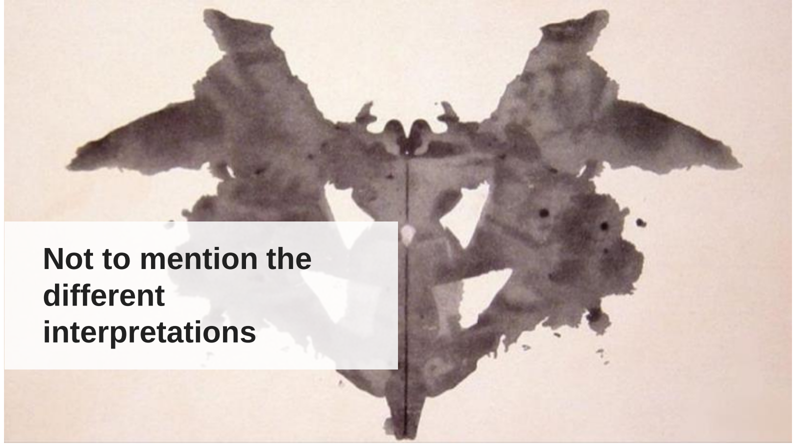
So many kinds of tests...



Tests, Tests, Glorious Tests!

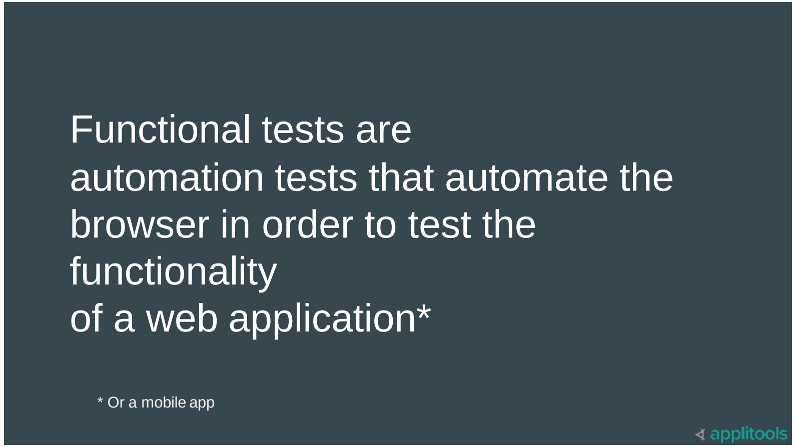
- Unit
- Integration
- E2E
- Acceptance
- Visual
- Contract
- Browser
- Automation
- Functional
- And the list goes on…

5



Not to mention the different interpretations

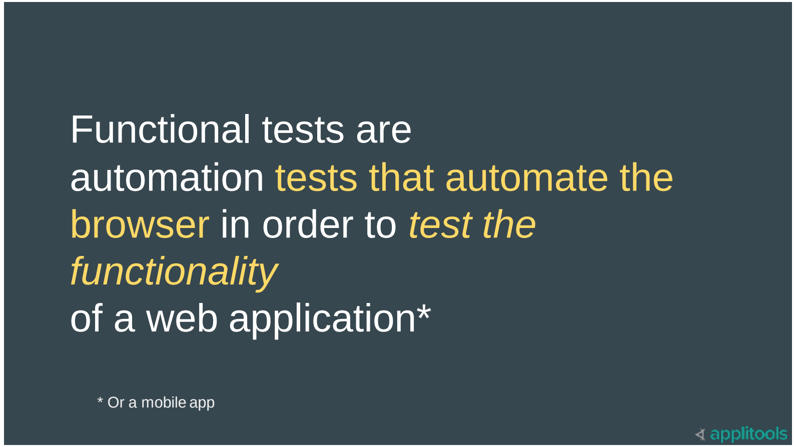
6



Functional tests are
automation tests that automate the browser in order to test the functionality
of a web application*

* Or a mobile app

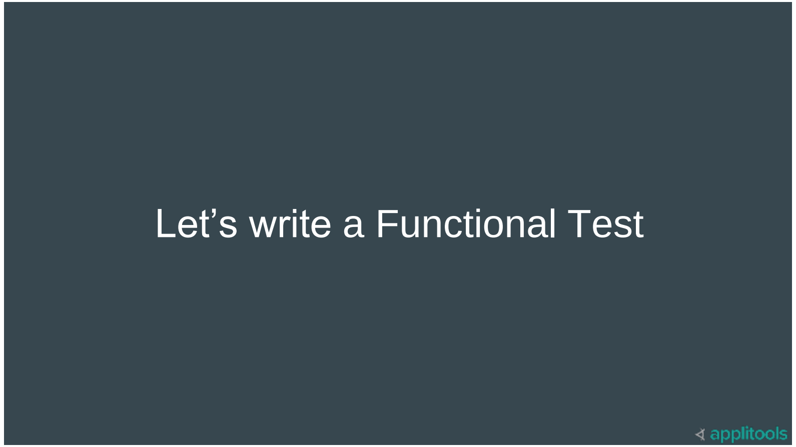
applitools



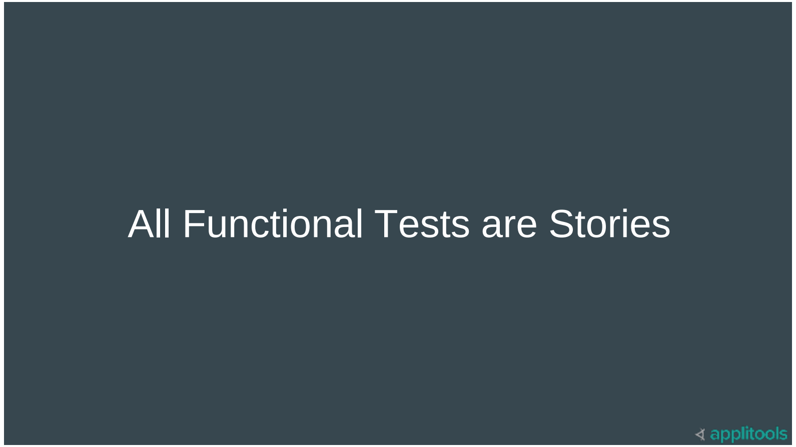
Functional tests are
automation tests that automate the browser in order to *test the functionality*
of a web application*

* Or a mobile app

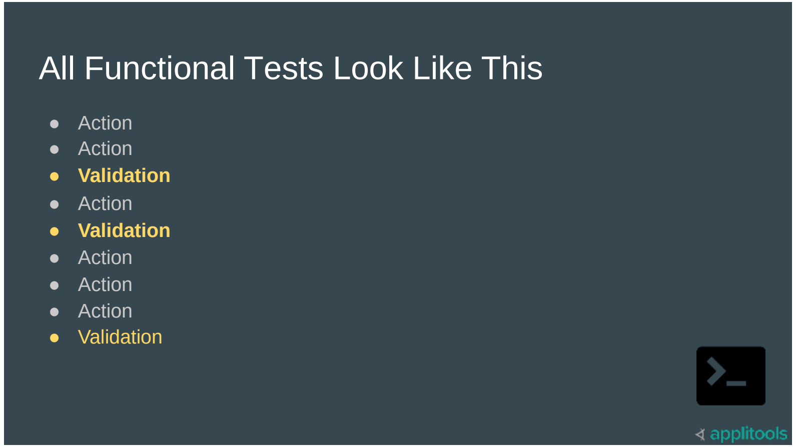
applitools



Let’s write a Functional Test



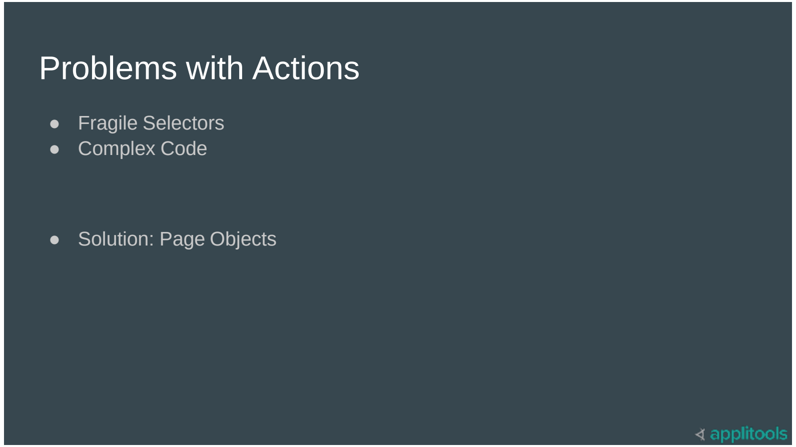
All Functional Tests are Stories



All Functional Tests Look Like This

- Action
- Action
- **Validation**
- Action
- **Validation**
- Action
- Action
- Action
- Validation

applitools

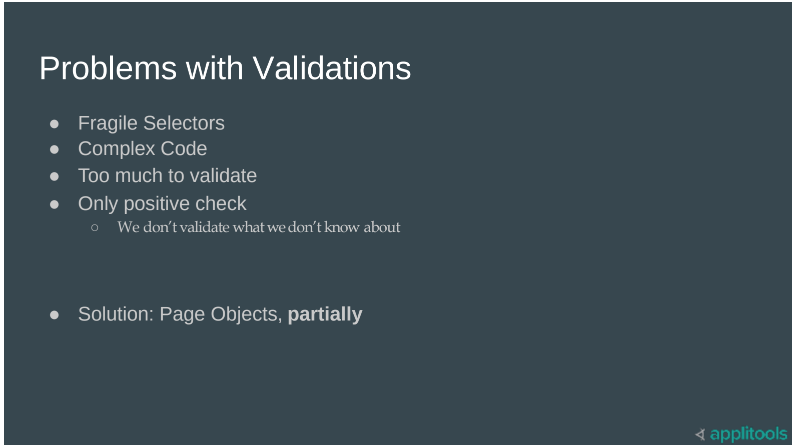


Problems with Actions

- Fragile Selectors
- Complex Code

- Solution: Page Objects

applitools



Problems with Validations

- Fragile Selectors
- Complex Code
- Too much to validate
- Only positive check
    - We don't validate what we don't know about

- Solution: Page Objects, **partially**

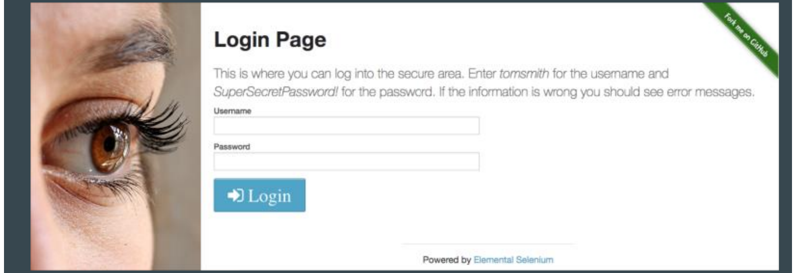
applitools

Actions are Focused

Validations ~~are~~ should be Wholistic

Solving the Validation Problem

Visual Testing !



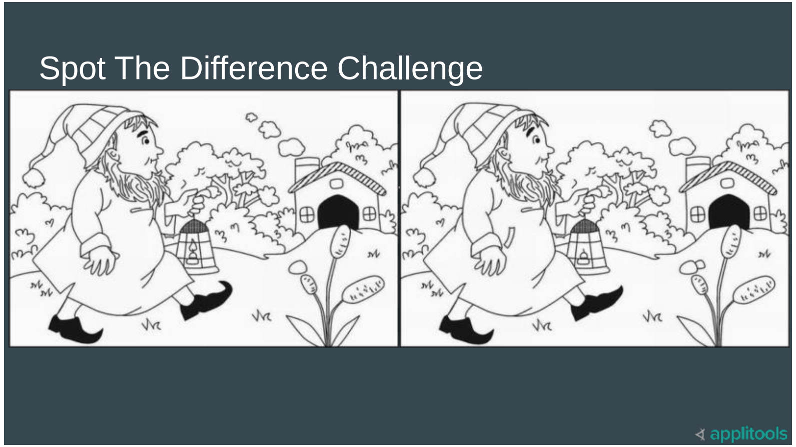
Login Page

This is where you can log into the secure area. Enter *tomsmith* for the username and *SuperSecretPassword!* for the password. If the information is wrong you should see error messages.

Username

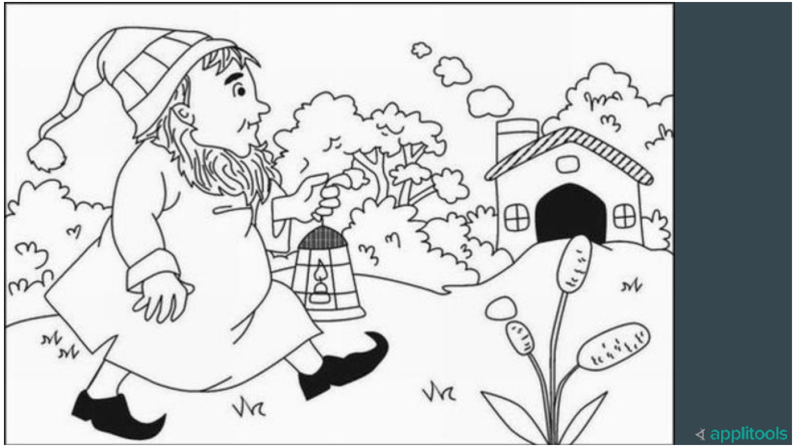
Password

Powered by Elemental Selenium

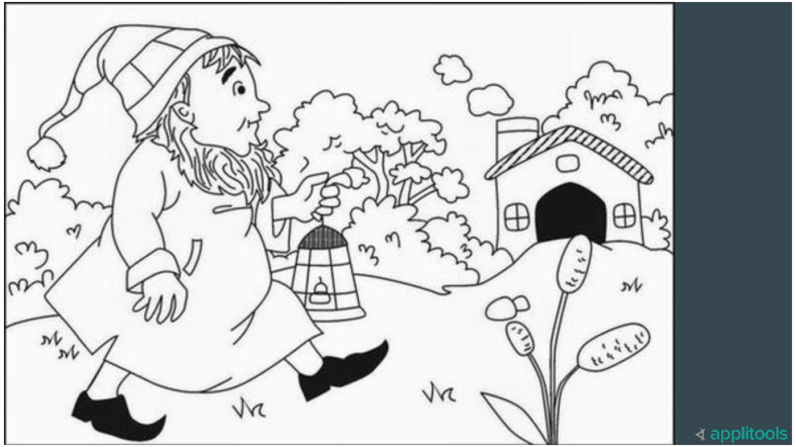


Spot The Difference Challenge

17



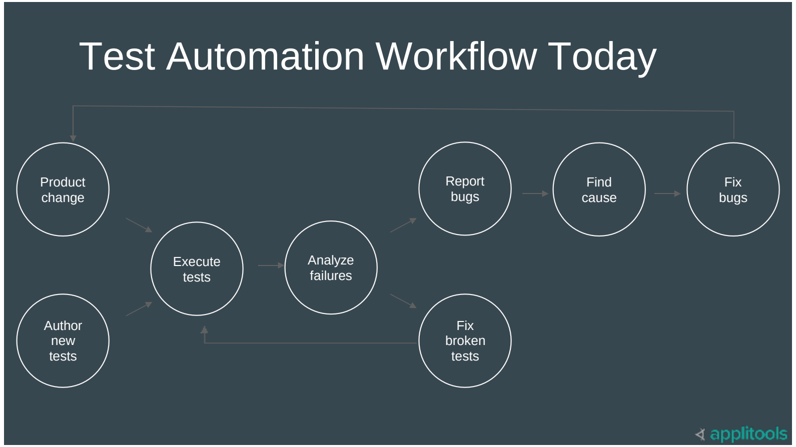
18



19

State of Test Automation

20



Test Automation Workflow Today

Product change

Author new tests

Execute tests

Analyze failures

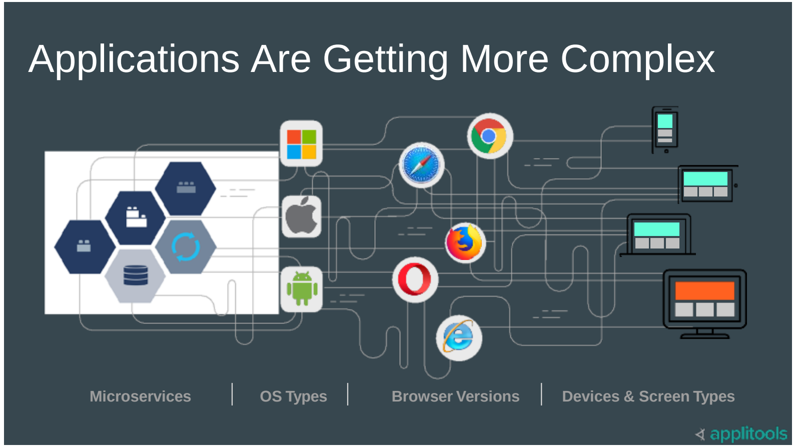
Report bugs

Find cause

Fix bugs

Fix broken tests

applitools

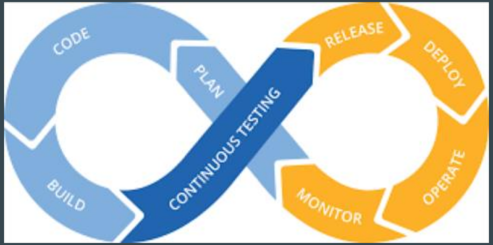


Applications Are Getting More Complex

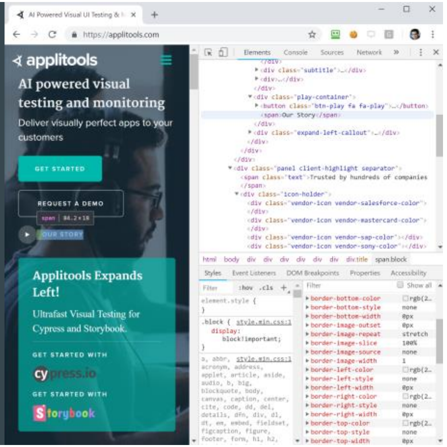
Microservices | OS Types | Browser Versions | Devices & Screen Types

applitools

Delivery Cycles Are Getting Faster


CODE
PLAN
RELEASE
DEPLOY
CONTINUOUS TESTING
BUILD
MONITOR
OPERATE

Every Page.
Every Application.
Hundreds Lines of Code.
Changing Constantly.


AI Powered Visual UI Testing &
https://applitools.com
applitools
GET STARTED
REQUEST A DEMO
span | 84.2 × 18
OUR STORY
GET STARTED WITH
cypress.io
GET STARTED WITH
Storybook
Elements
Console
Sources
Network
Styles
Event Listeners
DOM Breakpoints
Properties
Accessibility
Filter
:hov
.cls
Show all

AI powered visual testing and monitoring

Deliver visually perfect apps to your customers

Applitools Expands Left!

Ultrafast Visual Testing for Cypress and Storybook.

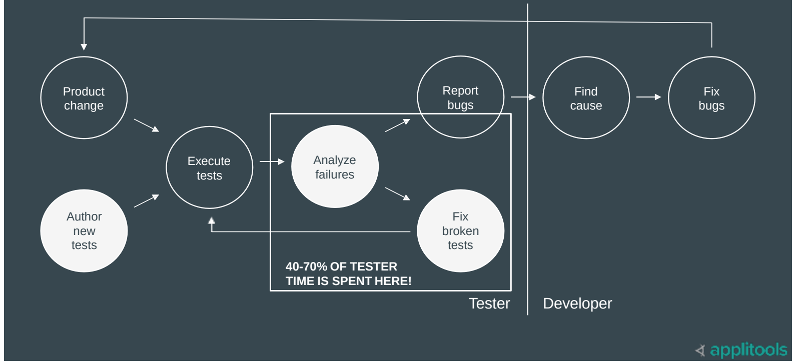
```
            </div>
              ▶<div class="subtitle">…</div>
              ▶<div>…</div>
            </div>
           ▼<div class="play-container">
              ▶<button class="btn-play fa fa-play">…</button>
               <span>Our Story</span>
            </div>
           ▶<div class="expand-left-callout">…</div>
          </div>
        </div>
      </div>
     ▼<div class="panel client-highlight separator">
        <span class="text">Trusted by hundreds of companies
        </span>
       ▼<div class="icon-holder">
          <div class="vendor-icon vendor-salesforce-color">
          </div>
          <div class="vendor-icon vendor-mastercard-color">
          </div>
          <div class="vendor-icon vendor-sap-color"></div>
          <div class="vendor-icon vendor-sony-color"></div>
```

```
html  body  div  div  div  div  div  div  div.title  span.block
```

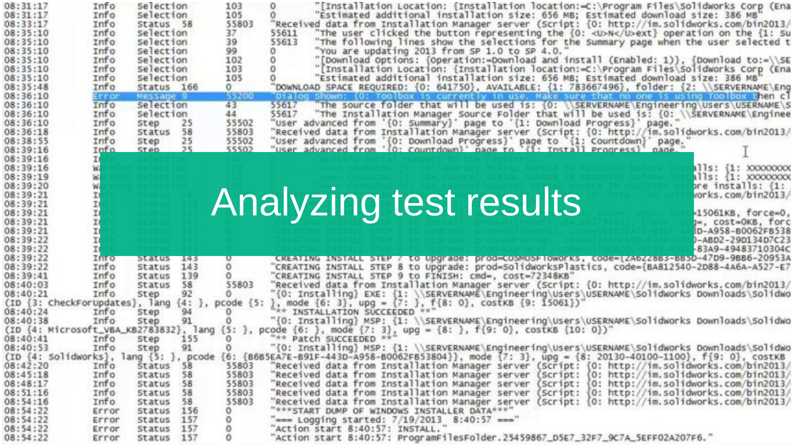
```
element.style {
}
.block {  style.min.css:1
  display:
     block!important;
}
a, abbr,  style.min.css:1
acronym, address,
applet, article, aside,
audio, b, big,
blockquote, body,
canvas, caption, center,
cite, code, dd, del,
details, dfn, div, dl,
dt, em, embed, fieldset,
figcaption, figure,
footer, form, h1, h2,
```

```
▶ border-bottom-color    ☐ rgb(2…
▶ border-bottom-style      none
▶ border-bottom-width      0px
▶ border-image-outset      0px
▶ border-image-repeat      stretch
▶ border-image-slice       100%
▶ border-image-source      none
▶ border-image-width       1
▶ border-left-color      ☐ rgb(2…
▶ border-left-style        none
▶ border-left-width        0px
▶ border-right-color     ☐ rgb(2…
▶ border-right-style       none
▶ border-right-width       0px
▶ border-top-color       ☐ rgb(2…
▶ border-top-style         none
▶ border-top-width         0px
```

Pain Point #1 - Low Test Coverage

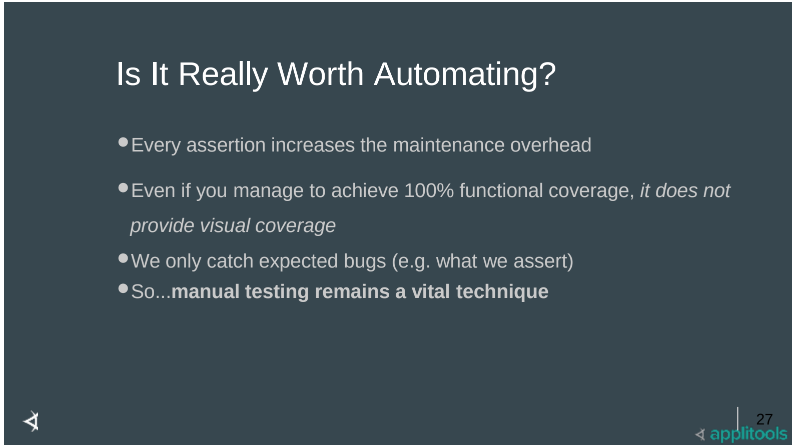


40-70% OF TESTER TIME IS SPENT HERE!



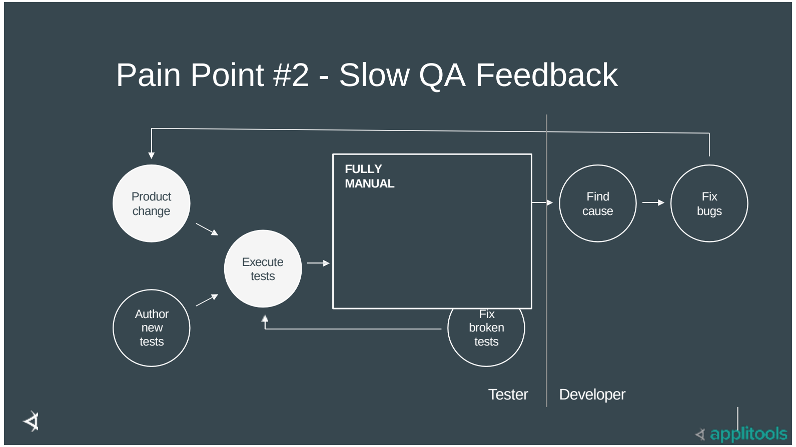
Analyzing test results

```
08:31:17        Info    Selection       103     0       "[Installation Location: {Installation location:=C:\Program Files\Solidworks Corp (Ena
08:31:17        Info    Selection       105     0       "Estimated additional installation size: 656 MB; Estimated download size: 386 MB"
08:33:17        Info    Status  58      55803   "Received data from Installation Manager server (Script: {0: http://im.solidworks.com/bin2013/
08:35:10        Info    Selection       37      55611   "The user clicked the button representing the {0: <U>N</U>ext} operation on the {1: Su
08:35:10        Info    Selection       39      55613   "The following lines show the selections for the Summary page when the user selected t
08:35:10        Info    Selection       99      0       "You are updating 2013 from SP 1.0 to SP 4.0."
08:35:10        Info    Selection       102     0       "[Download Options: {Operation:=Download and install (Enabled: 1)}, {Download to:=\\SE
08:35:10        Info    Selection       103     0       "[Installation Location: {Installation location:=C:\Program Files\Solidworks Corp (Ena
08:35:10        Info    Selection       105     0       "Estimated additional installation size: 656 MB; Estimated download size: 386 MB"
08:35:48        Info    Status  166     0       "DOWNLOAD SPACE REQUIRED: {0: 641750}, AVAILABLE: {1: 783667496}, folder: {2: \\SERVERNAME\Eng
08:36:10        Error   Message 9       55200   "Dialog Shown: {0: Toolbox is currently in use. Make sure that no one is using Toolbox then cl
08:36:10        Info    Selection       43      55617   "The source folder that will be used is: {0: \\SERVERNAME\Engineering\Users\USERNAME\S
08:36:10        Info    Selection       44      55617   "The Installation Manager Source Folder that will be used is: {0: \\SERVERNAME\Enginee
08:36:10        Info    Step    25      55502   "User advanced from '{0: Summary}' page to '{1: Download Progress}' page."
08:36:18        Info    Status  58      55803   "Received data from Installation Manager server (Script: {0: http://im.solidworks.com/bin2013/
08:38:55        Info    Step    25      55502   "User advanced from '{0: Download Progress}' page to '{1: Countdown}' page."
08:39:16        Info    Step    25      55502   "User advanced from '{0: Countdown}' page to '{1: Install Progress}' page."
08:39:16        Info    Selection       107     0       "Writing serial numbers to the registry..."
08:39:16        Warning Selection       110     0       "====> CHANGING {0: solidworks} SERIAL NUMBER IN REGISTRY before installs: {1: XXXXXXXX
08:39:19        Warning Selection       110     0       "====> CHANGING {0: cae_cwcore} SERIAL NUMBER IN REGISTRY before installs: {1: XXXXXXXX
08:39:20        Warning Selection       110     0       "====> CHANGING {0: cae_cosmosfloworks} SERIAL NUMBER IN REGISTRY before installs: {1:
08:39:21        Info    Status  58      55803   "Received data from Installation Manager server (Script: {0: http://im.solidworks.com/bin2013/
08:39:21        Info    Status  138     [illegible]
08:39:21        Info    Status  143     0       [illegible] code=, upg=, cost=15061KB, force=0,
08:39:21        Info    Status  143     0       "CREATING INSTALL STEP 3 to install: prod=Microsoft_VBA_KB2783832, code=, upg=, cost=0KB, forc
08:39:21        Info    Status  143     0       "CREATING INSTALL STEP 4 to Upgrade: prod=Solidworks, code={B6B5EA7E-B91F-443D-A958-B0062FB538
08:39:22        Info    Status  143     0       "CREATING INSTALL STEP 5 to Upgrade: prod=eDrawings, code={2686C860-19AF-49[illegible]-ABD2-29D134D7C23
08:39:22        Info    Status  143     0       "CREATING INSTALL STEP 6 to Upgrade: prod=Explorer, code={168EB206-FC09-4D2[illegible]-83A9-49483710304C
08:39:22        Info    Status  143     0       "CREATING INSTALL STEP 7 to Upgrade: prod=COSMOSFloWorks, code={2A6228B3-BB5D-47D9-9BB6-20953A
08:39:22        Info    Status  143     0       "CREATING INSTALL STEP 8 to Upgrade: prod=SolidworksPlastics, code={BA812540-2D88-4A6A-A527-E7
08:39:41        Info    Status  139     0       "CREATING INSTALL STEP 9 to FINISH: cmd=, cost=72348KB"
08:40:03        Info    Status  58      55803   "Received data from Installation Manager server (Script: {0: http://im.solidworks.com/bin2013/
08:40:21        Info    Step    92      0       "{0: Installing} EXE: {1: \\SERVERNAME\Engineering\Users\USERNAME\Solidworks Downloads\Solidwo
(ID {3: CheckForUpdates}, lang {4: }, pcode {5: }, mode {6: 3}, upg = {7: }, f{8: 0}, costKB {9: 15061})"
08:40:24        Info    Step    94      0       "** INSTALLATION SUCCEEDED **"
08:40:38        Info    Step    91      0       "{0: Installing} MSP: {1: \\SERVERNAME\Engineering\Users\USERNAME\Solidworks Downloads\Solidwo
(ID {4: Microsoft_VBA_KB2783832}, lang {5: }, pcode {6: }, mode {7: 3}, upg = {8: }, f{9: 0}, costKB {10: 0})"
08:40:41        Info    Step    155     0       "** Patch SUCCEEDED **"
08:40:53        Info    Step    91      0       "{0: Installing} MSP: {1: \\SERVERNAME\Engineering\Users\USERNAME\Solidworks Downloads\Solidwo
(ID {4: Solidworks}, lang {5: }, pcode {6: {B6B5EA7E-B91F-443D-A958-B0062FB53804}}, mode {7: 3}, upg = {8: 20130-40100-1100}, f{9: 0}, costKB
08:42:20        Info    Status  58      55803   "Received data from Installation Manager server (Script: {0: http://im.solidworks.com/bin2013/
08:45:18        Info    Status  58      55803   "Received data from Installation Manager server (Script: {0: http://im.solidworks.com/bin2013/
08:48:17        Info    Status  58      55803   "Received data from Installation Manager server (Script: {0: http://im.solidworks.com/bin2013/
08:51:16        Info    Status  58      55803   "Received data from Installation Manager server (Script: {0: http://im.solidworks.com/bin2013/
08:54:16        Info    Status  58      55803   "Received data from Installation Manager server (Script: {0: http://im.solidworks.com/bin2013/
08:54:22        Error   Status  156     0       "***START DUMP OF WINDOWS INSTALLER DATA***"
08:54:22        Error   Status  157     0       "=== Logging started: 7/19/2013  8:40:57 ==="
08:54:22        Error   Status  157     0       "Action start 8:40:57: INSTALL."
08:54:22        Error   Status  157     0       "Action start 8:40:57: ProgramFilesFolder.25459867_D5E7_32F7_9C7A_5EFF02A207F6."
```



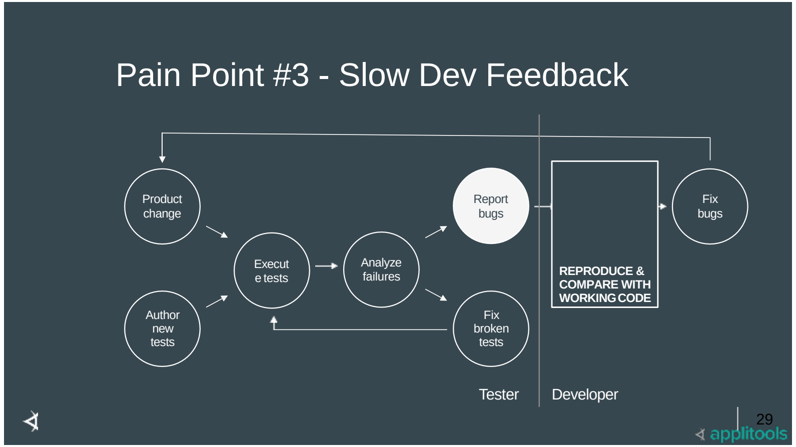
Is It Really Worth Automating?

- Every assertion increases the maintenance overhead
- Even if you manage to achieve 100% functional coverage, *it does not provide visual coverage*
- We only catch expected bugs (e.g. what we assert)
- So...**manual testing remains a vital technique**



Pain Point #2 - Slow QA Feedback

Product change
Author new tests
Execute tests
FULLY MANUAL
Fix broken tests
Find cause
Fix bugs
Tester
Developer



Pain Point #3 - Slow Dev Feedback

Product change

Author new tests

Execute tests

Analyze failures

Report bugs

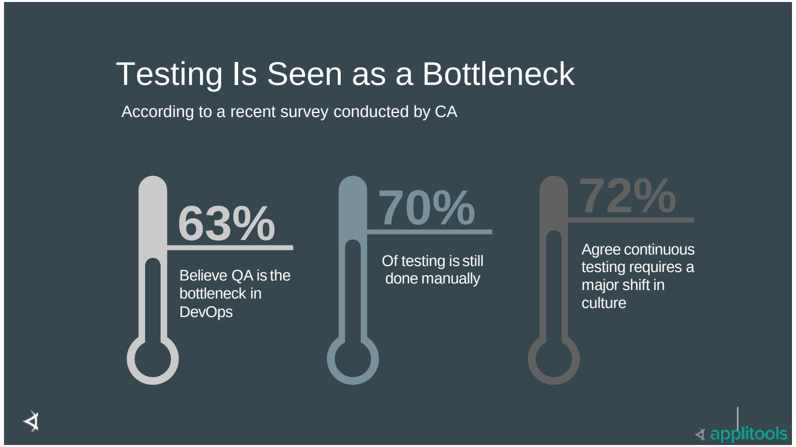
Fix broken tests

REPRODUCE & COMPARE WITH WORKING CODE

Fix bugs

Tester

Developer



Testing Is Seen as a Bottleneck

According to a recent survey conducted by CA

63% Believe QA is the bottleneck in DevOps

70% Of testing is still done manually

72% Agree continuous testing requires a major shift in culture

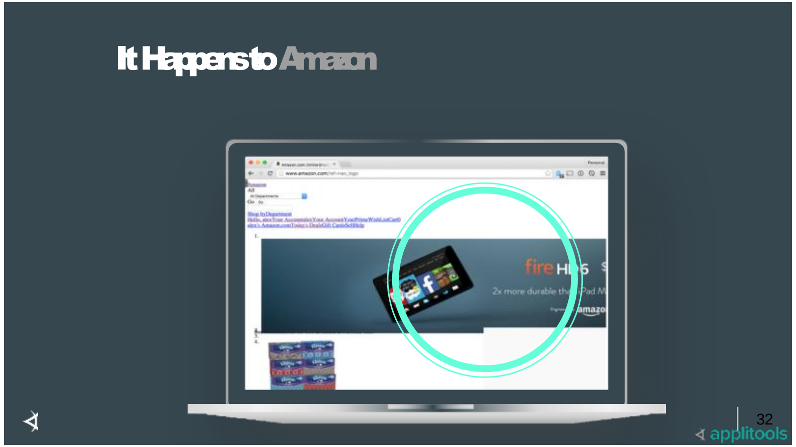
Testing is seen as a Bottleneck

Testing is vital...

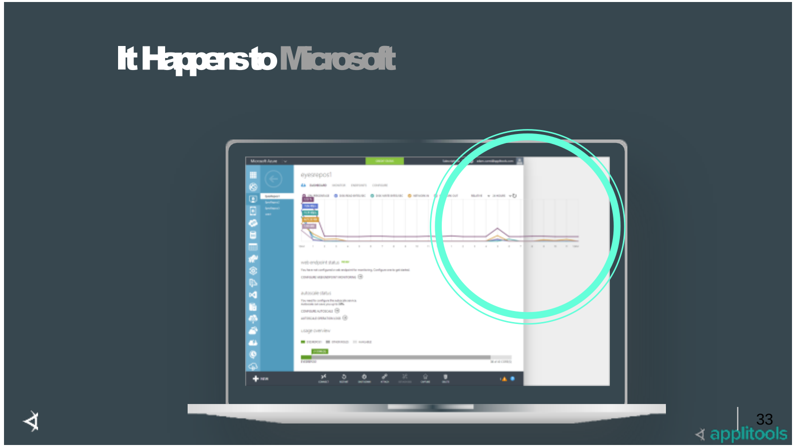
- Protect quality
- Represent the end user
- Critical to business success

But success for teams is challenging.

- Visual and functional bugs escape routinely
- Hard to keep up with R&D pace and complexity
- No obvious solution in sight
- Team morale can suffer



It Happens to Amazon

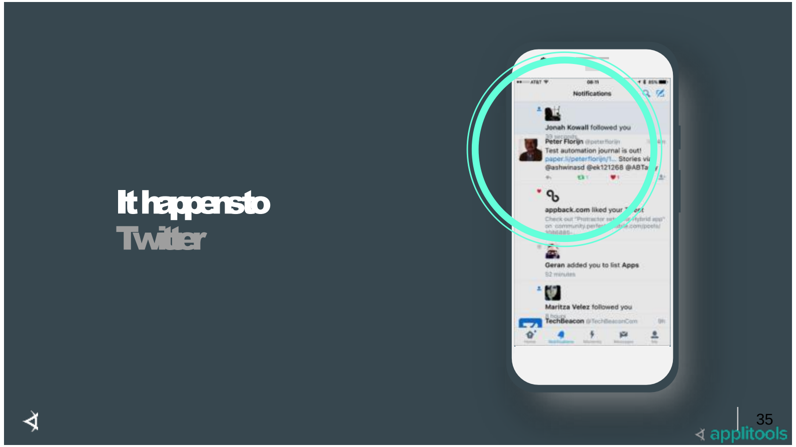


It Happens to Microsoft

33

It Happens to UPS

34



It happens to Twitter

Notifications

Jonah Kowall followed you

Peter Florijn @peterflorijn

Test automation journal is out! paper.li/peterflorijn/1… Stories via @ashwinasd @ek121268 @ABTa…

appback.com liked your Tweet

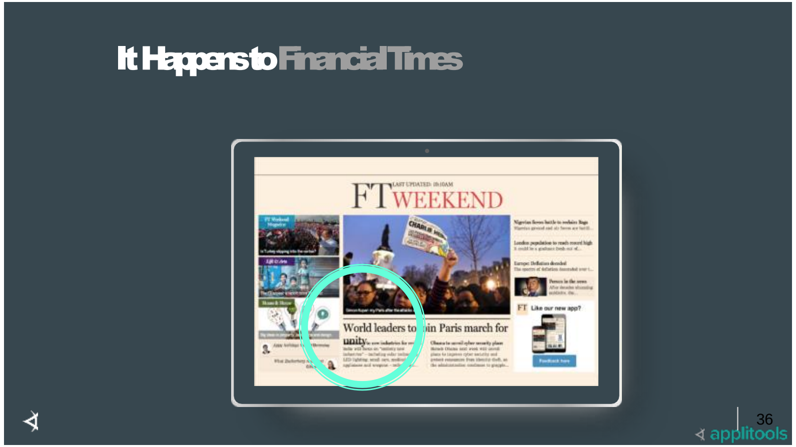
Geran added you to list **Apps**

52 minutes

Maritza Velez followed you

TechBeacon @TechBeaconCom

AT&T
applitools



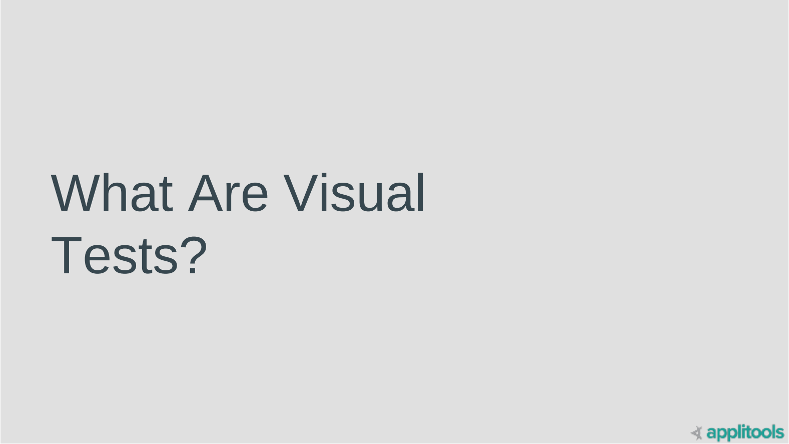
It Happens to Financial Times

FT WEEKEND

World leaders to join Paris march for unity

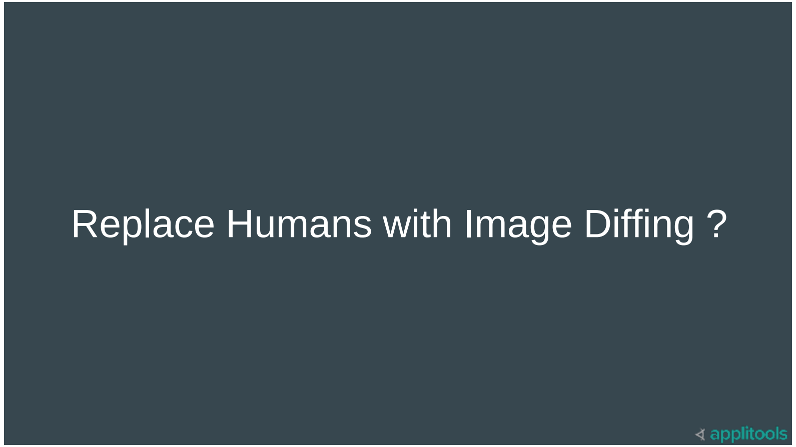
Like our new app?

LAST UPDATED
Feedback here
applitools



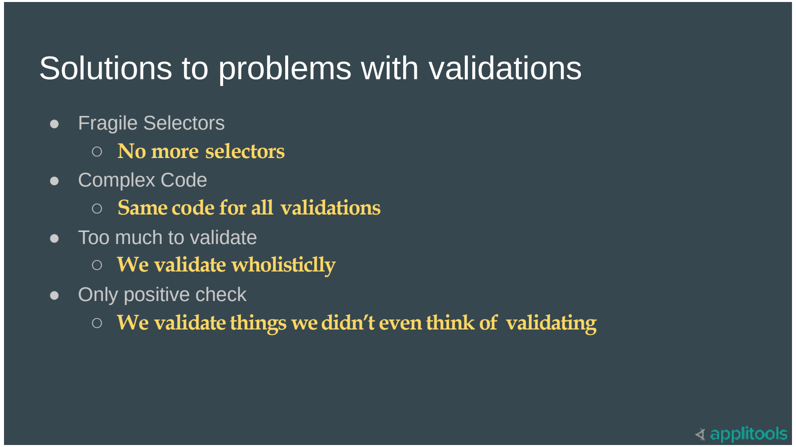
What Are Visual Tests?

applitools



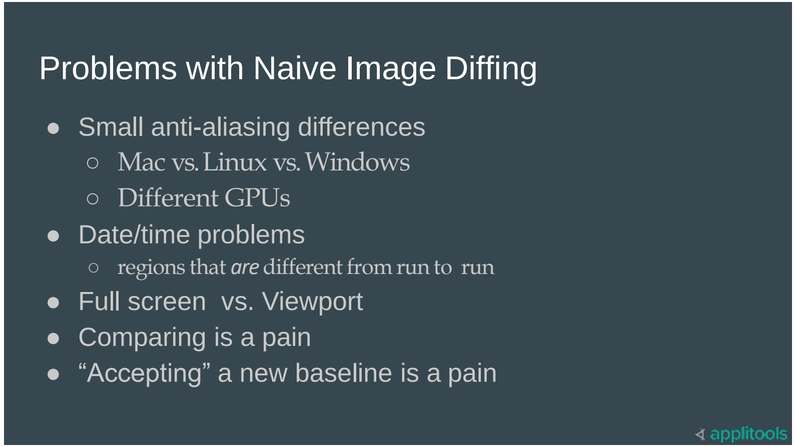
Replace Humans with Image Diffing ?

applitools



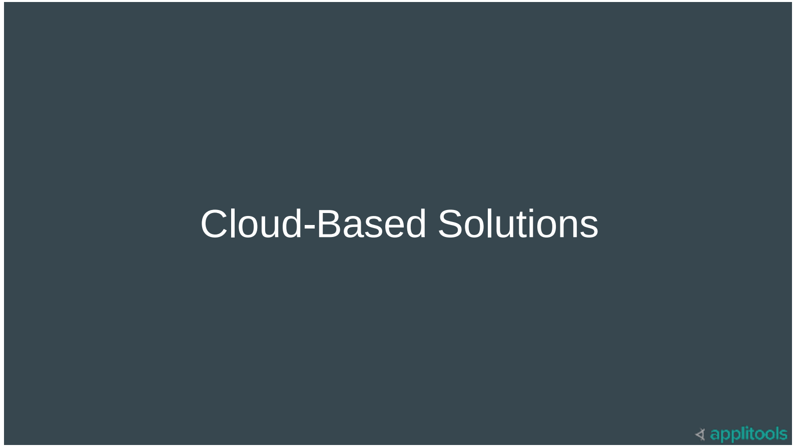
Solutions to problems with validations

- Fragile Selectors
  - **No more selectors**
- Complex Code
  - **Same code for all validations**
- Too much to validate
  - **We validate wholisticlly**
- Only positive check
  - **We validate things we didn't even think of validating**



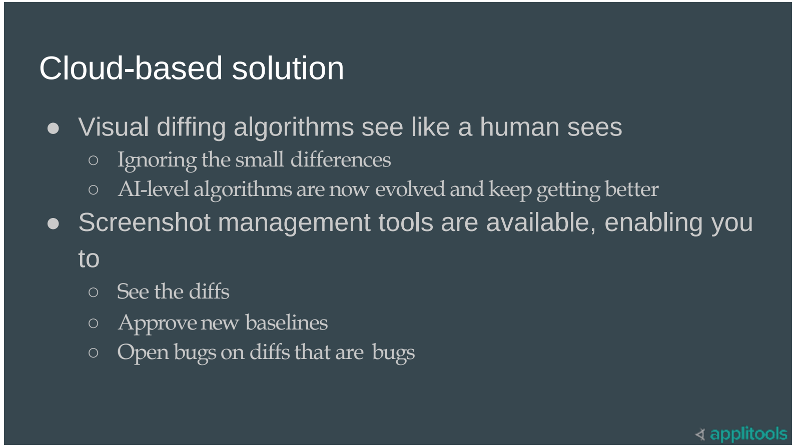
Problems with Naive Image Diffing

- Small anti-aliasing differences
  - Mac vs. Linux vs. Windows
  - Different GPUs
- Date/time problems
  - regions that *are* different from run to run
- Full screen vs. Viewport
- Comparing is a pain
- “Accepting” a new baseline is a pain



Cloud-Based Solutions

applitools

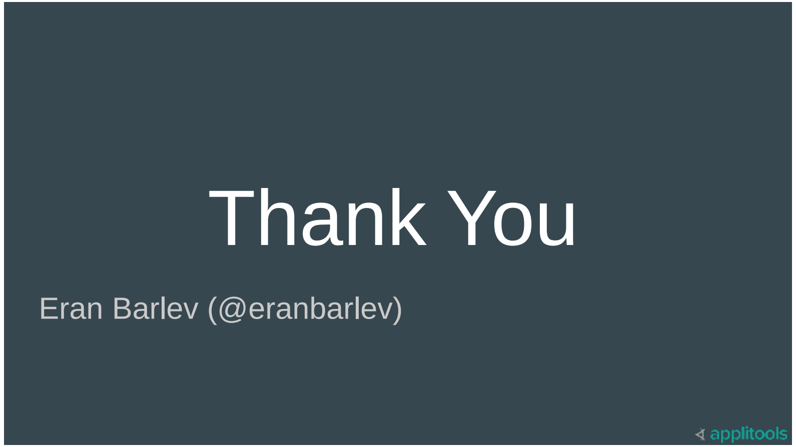


Cloud-based solution

- Visual diffing algorithms see like a human sees
  - Ignoring the small differences
  - AI-level algorithms are now evolved and keep getting better
- Screenshot management tools are available, enabling you to
  - See the diffs
  - Approve new baselines
  - Open bugs on diffs that are bugs

applitools

Let’s Run the Demo



Thank You

Eran Barlev (@eranbarlev)