



# Better Continuous Testing in DevOps



## Rod Cope, CTO Perforce Software

- CTO for Rogue Wave Software (now Perforce) and the Founder and CTO of OpenLogic.
- 25+ year software career includes IBM, IBM Global Services, General Electric, and Anthem Blue Cross/Blue Shield.
- Worldwide event speaker, including: JavaOne, OSCON, Embedded World, ApacheCon, Strata/Big Data, LinuxCon, and API World.



# Today's Agenda

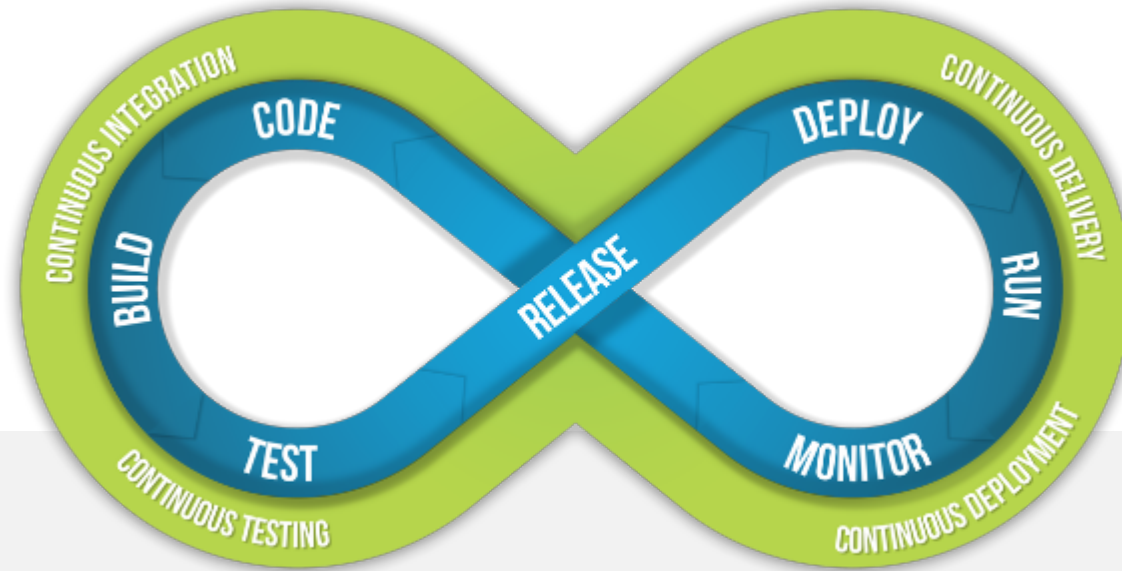
- 1 What is Continuous Testing (CT) and why is it hard?
- 2 Key elements of CT in DevOps
- 3 Personas and balance
- 4 Challenges, recommendations, and metrics
- 5 Putting it all together

# The Agile Testing Manifesto

## THE DEVTESTOPS MANIFESTO

- ✓ **Continuous testing** over testing at the end
- ✓ Embracing **all testing activities** over only automated functional testing
- ✓ Testing **what gives value** over testing everything
- ✓ **Testing across the team** over testing in siloed testing departments
- ✓ **Product coverage** over code coverage

## What Is Continuous Testing?



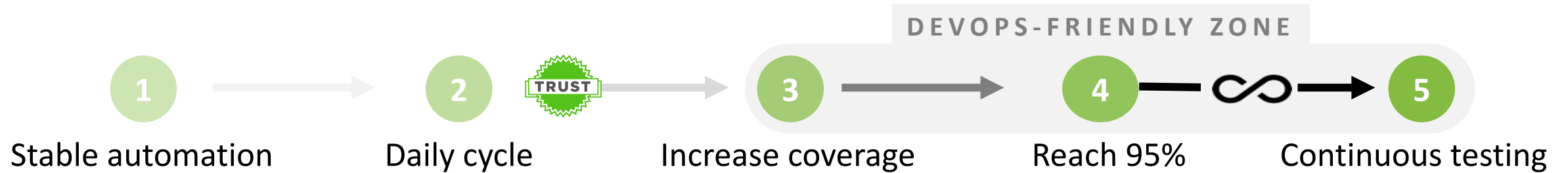
Continuous testing: execute automated tests in the software delivery pipeline to get feedback on **business risks** for a software release.

## How Does CT Fit in the DevOps Formula?

**CONTINUOUS DELIVERY (CD) = CONTINUOUS INTEGRATION (CI) +  
CONTINUOUS TESTING (CT)**

CT = ~90% (Correct) **Stable Test Automation**

# The Path to Continuous Testing



## WHAT YOU'LL DO AND GET

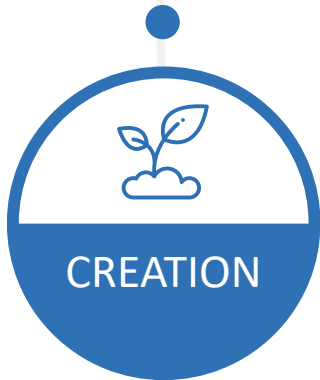
- |   |   |  |   |  |
|---|---|--|---|--|
| <ul style="list-style-type: none"> <li>• Create scripts</li> <li>• Maintain scripts</li> <li>• Understand what's wrong</li> </ul> | <ul style="list-style-type: none"> <li>• Run scripts daily</li> <li>• Get results in minutes</li> </ul> | <ul style="list-style-type: none"> <li>• Valuable coverage</li> <li>• Meaningful daily feedback</li> </ul> | <ul style="list-style-type: none"> <li>• Automate all that is possible</li> </ul> | <ul style="list-style-type: none"> <li>• Nightly → Continuously</li> </ul> |
|---|---|--|---|--|

## WHAT YOU'LL NEED

- |   |  |  |   |   |
|---|--|--|---|---|
| <ul style="list-style-type: none"> <li>• <b>Skillset matched tool</b></li> <li>• False negative detection in reports</li> </ul> | <ul style="list-style-type: none"> <li>• <b>99.9% available lab</b></li> <li>• Evidence collection</li> <li>• Process integration             <ul style="list-style-type: none"> <li>• CI</li> <li>• Defect tracking</li> </ul> </li> <li>• Execution control</li> <li>• Dashboards</li> </ul> | <ul style="list-style-type: none"> <li>• Advanced validations</li> <li>• Visual automation</li> <li>• Basic orchestration</li> <li>• <b>Up-to-date lab</b></li> <li>• <b>Scaled lab</b></li> <li>• <b>Analysis grouping</b></li> </ul> | <ul style="list-style-type: none"> <li>• Advanced orchestration             <ul style="list-style-type: none"> <li>• Elasticity</li> <li>• Sharding</li> </ul> </li> <li>• <b>Environment control</b></li> <li>• <b>Scaled reporting</b></li> </ul> | <ul style="list-style-type: none"> <li>• Cloud execution</li> <li>• <b>Very high scale</b></li> </ul> |
|---|--|--|---|---|

# The 4 Key Pillars of Continuous Testing in DevOps

Unified solution serves DevOps with greater efficiency



- Test creation and maintenance
- Authoring tool
  - Validations



- Test execution
- Scale
  - Orchestration
  - Frameworks



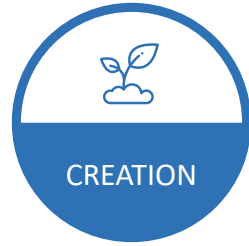
- Lab for continuous testing
- Backbone for all testing
  - Devices & management
  - Availability & scaling
  - Supporting functions



- Test analysis
- Fast feedback
  - Root cause analysis



Continuous testing is an essential part of DevOps



### **Skillset-matched test automation environment**

- Flexibility to work in codeless, BDD, or OSS frameworks
- Object & visual automation
- Support for extended digital capabilities (camera, fingerprint, etc.)



### **Highly-scalable open, and managed test execution**

- Open & integrated with automation, orchestration & CI solutions
- Flexible scaling with queuing, prioritization, and sharding
- Visible & controllable execution control



### **Secure enterprise-grade lab**

- Always available, always updated, and fully-managed lab
- Rich artifact collection abilities
- Support environment control requirements



### **"Single pane of glass" for all test executions**

- Effective test result triaging & analysis
- Grouping & noise filtering
- Scales to support large volume of test data



# Continuous Testing: The Three Personas

## BUSINESS TESTER

Performs exploratory and structured **manual** testing

## SDET (SOFTWARE DEVELOPMENT ENGINEER IN TEST)

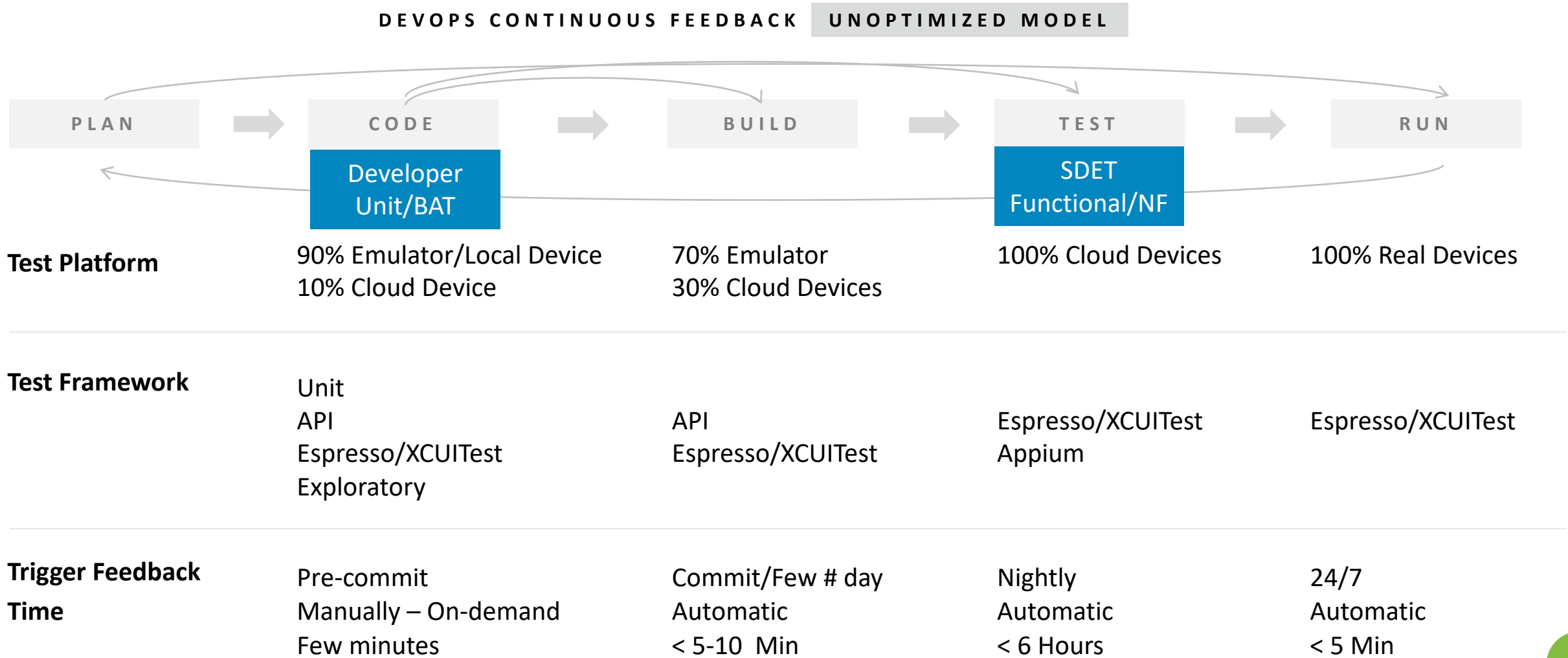
Creates functional and nonfunctional code-based test automation scripts (via Selenium, Appium, etc.)

## SOFTWARE DEVELOPER

Creates unit and build acceptance tests



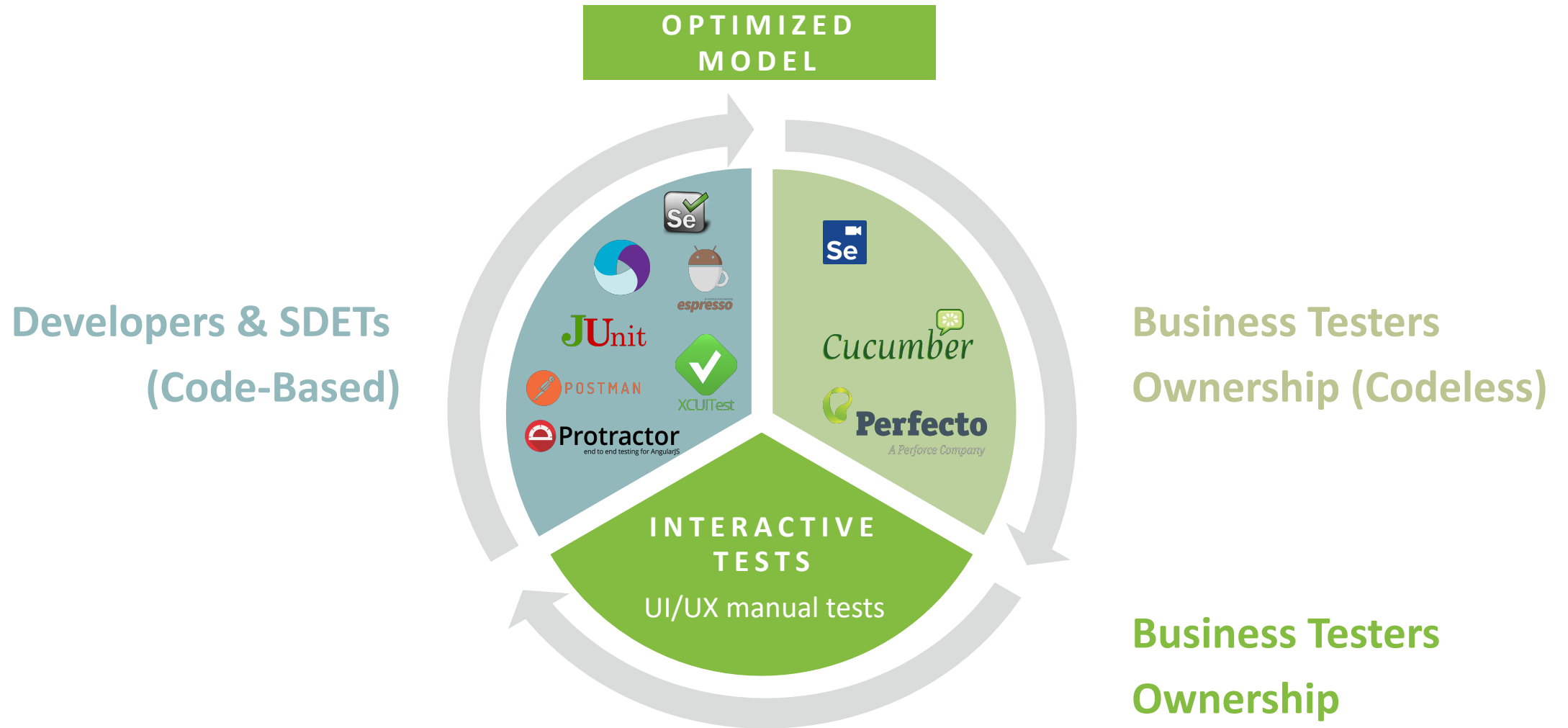
# Persona-Based Challenges in Continuous Testing



Business Tester:  
Manual?  
Exploratory?  
BDD? Codeless?



# Balancing Test Creation for the Three Different Personas With the Right Tools



# Collaborative Approach – Codeless & Code-Based

Perfecto Test Analysis CI Dashboard Heatmap Report Library Live Stream Updated: 17:07

Unsaved View Latest reports Search report by name

Hide charts

Total Success Rate Latest reports, Jun 19

History

11 TESTS | 2 FAILED | 7 PASSED | 2 UNKNOWN

| Report Name  | Status | form | Device               |             |               | Time                  |              | Tags | Lab      | Automation Framework |
|--|--------|------|----------------------|-------------|---------------|-----------------------|--------------|------|----------|----------------------|
|  |        |      | Device model         | Browser     | OS            | Start                 | Duration     |      |          |                      |
| <input type="checkbox"/> Search Quantum with results | ?      |      | Apple iPhone-7       |             | Apple 10.0.1  | Jun 19, 2019 17:07:18 |              | 4    | PERFECTO | Selenium             |
| <input type="checkbox"/> Search Keyword Inline Data  | ?      |      | Samsung Galaxy S5... |             | Android 6.0.1 | Jun 19, 2019 17:07:13 |              | 4    | PERFECTO | Selenium             |
| <input type="checkbox"/> Search Quantum with results | ✓      |      | Samsung Galaxy S5... |             | Android 6.0.1 | Jun 19, 2019 17:07:02 | 10s 145ms    | 4    | PERFECTO | Selenium             |
| <input type="checkbox"/> Search Quantum              | ✓      |      | Apple iPhone-7       |             | Apple 10.0.1  | Jun 19, 2019 17:06:56 | 21s 496ms    | 4    | PERFECTO | Selenium             |
| <input type="checkbox"/> Search Quantum              | ✓      |      | Samsung Galaxy S5... |             | Android 6.0.1 | Jun 19, 2019 17:06:44 | 18s 280ms    | 4    | PERFECTO | Selenium             |
| <input type="checkbox"/> Exploratory                 | ✓      |      | Windows VM           | latest (18) | Windows 10    | Jun 19, 2019 08:55:42 | 1m 41s 156ms |      | PERFECTO | Codeless             |
| <input type="checkbox"/> Exploratory                 | !      |      | Windows VM           | beta (72)   | Windows 10    | Jun 19, 2019 08:55:24 | 30s 246ms    |      | PERFECTO | Codeless             |
| <input type="checkbox"/> Exploratory                 | ✓      |      | Windows VM           | 11          | Windows 8.1   | Jun 19, 2019 08:55:23 | 1m 13s 523ms |      | PERFECTO | Codeless             |
| <input type="checkbox"/> Exploratory                 | ✓      |      | Windows VM           | latest (18) | Windows 10    | Jun 19, 2019 02:55:36 | 1m 29s 318ms |      | PERFECTO | Codeless             |
| <input type="checkbox"/> Exploratory                 | !      |      | Windows VM           | beta (72)   | Windows 10    | Jun 19, 2019 02:55:28 | 30s 455ms    |      | PERFECTO | Codeless             |
| <input type="checkbox"/> Exploratory                 | ✓      |      | Windows VM           | 11          | Windows 8.1   | Jun 19, 2019 02:55:22 | 1m 12s 246ms |      | PERFECTO | Codeless             |



# Top 5 Automation Challenges: Continuous Testing Blockers

TESTING IS KEY TO  
RELEASING FASTER

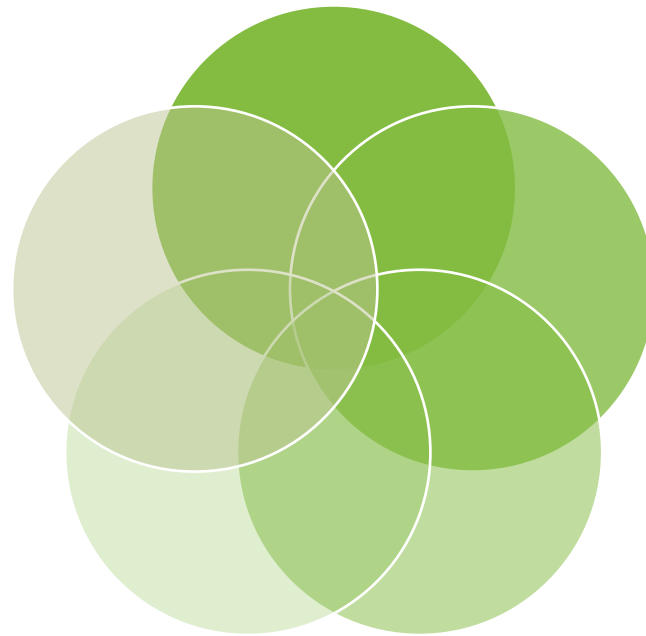
Less time to  
automate

Skillset mismatch

Unreliable tests

Test maintenance

Unoptimized  
execution





# Tighter Release Schedule Leaves Less Time to Automate and Test

- Consider ATDD/BDD/codeless software development practices.
- Build a consistent and unified CI process between Dev-QA-OPS and eliminate “shadow CI.”
- Consider adjusting your test pyramid and focus on the highly valuable and fastest test suites.
- Leverage faster test frameworks (XCUITest, Espresso, headless — Puppeteer, etc.).

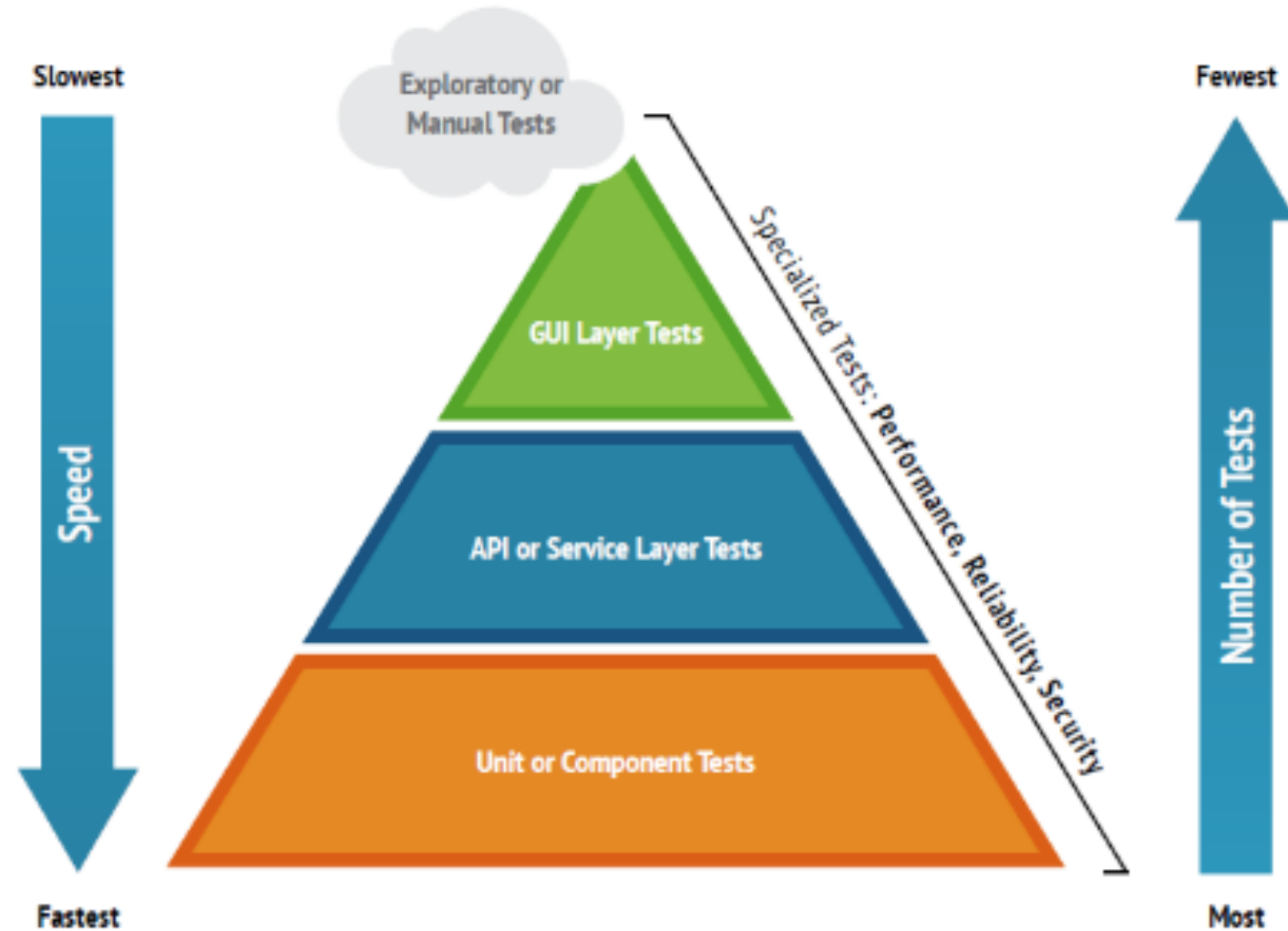


Fig. 2: The Test Automation Pyramid  
(Source: Accelerate Development with Automated Testing (Forrester, March 2017))

# Lack of Test Automation Stability and Reliability Block Continuous Testing

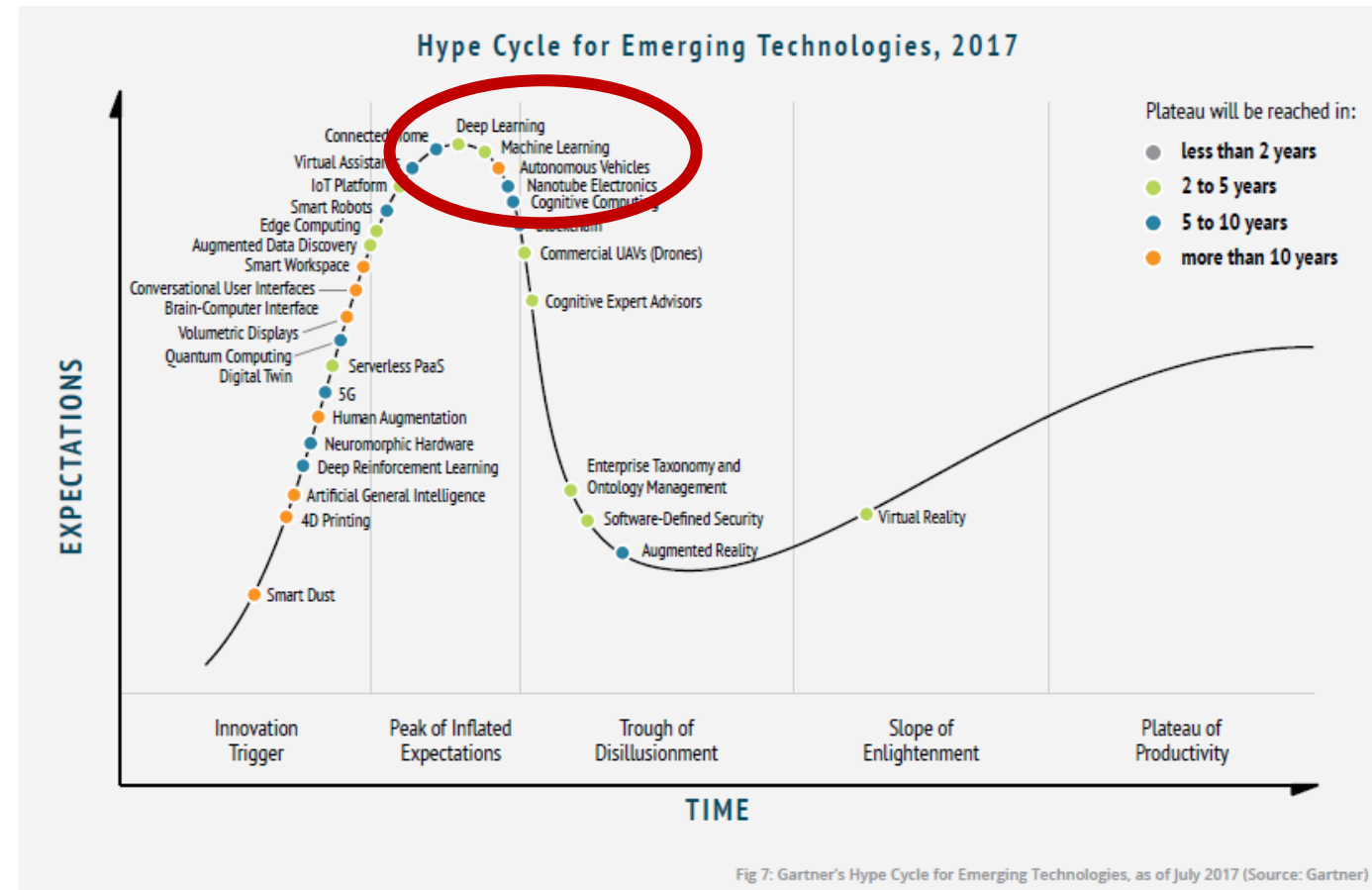
- Test authoring based on industry standards (POM, automate what's right)
  - Continuously maintain your test as you maintain code (SCM)
  - Consider breaking your tests into sub-test suites based on context
- Gain control over your test suites through measurements and agreed-upon KPIs
- Stabilize your lab and testing environment
- Make sure your target platforms are in “ready state” mode



Fig. 4: Sketch Notes from SeleniumConf 2017 (source: [KatjaSays Site](https://www.katjasays.com/))

# Test Execution Management Isn't Intelligent and Optimized Enough

- Start exploring innovative machine learning tools that can optimize your test code
- Refactor test code and include tagging, analytics hooks, and other post-execution debugging capabilities



## Test Authoring — Treat Test Code as Production Code

Test automation code is code — maintaining, versioning, reviewing, and leveraging best practices are key for stable automation, stable CI, and a stable pipeline.

### SOME EXAMPLES

- Pairing/coaching
- Use the right object identification strategy
- Use the right test framework
- Measure test efficiency within the CI
- Risk-based approach to test automation
- Continuous test data analysis and improvement



## Some Recommended CT Measurements (KPIs)



- **How fast** are your tests?
  - Test duration
  - Test flakiness
  - Percentage of automated vs. manual tests
- **Application quality** measurements
  - Number of escaped defects and in which areas
  - MTTD — mean time to detection of defect
  - Build quality
- **Pipeline efficiency** measurements
  - Number of user stories implemented per iteration
  - Test automation as part of DoD across iterations
  - Broken builds with categories
  - CI length trending
  - Lab availability and utilization
- **Quality cost** measurements
  - Operational costs, lab availability issues
  - Cost of hardware/software
  - Costs of defects by severity and stage

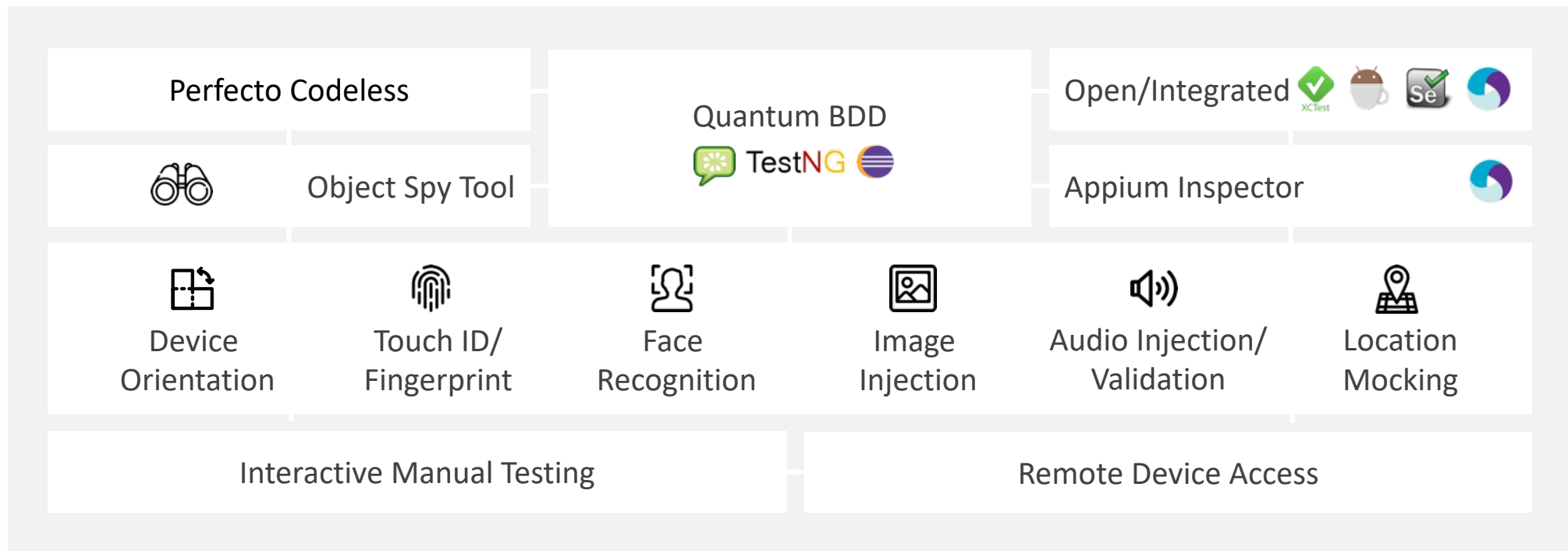




# CREATION

Minimum capability:

Highly productive web & mobile test automation





# EXECUTION

Minimum capability:

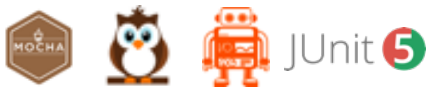
Fast mobile test execution and elasticity

## OPEN & INTEGRATED

Automation Frameworks



Execution Frameworks



Orchestration Frameworks



Continuous Integration



## ORCHESTRATION SUPPORT

1. Queuing
2. Prioritization and Bursting
3. Sharding

## EXECUTION MANAGEMENT

Test Executions (25)

| Name                      | Owner          | Time     |              | Now running on |        |         |            |    | More |
|---------------------------|----------------|----------|--------------|----------------|--------|---------|------------|----|------|
|                           |                | Start    | Duration     | Device model   | OS     | Browser | Resolution |    |      |
| My favorite test execu... | John Johnson   | 15:59:22 | 21m 1s 20ms  | Apple iPhone 4 | 9.2    |         |            | +2 |      |
| Selenium test execution   | Oren A         | 15:52:18 | 5m 21s 20ms  | Apple iPad 9.7 | 9.2    |         |            |    |      |
| Web test executio...      | Reporting team | 15:48:11 | 3m 20s 50ms  | Windows VM     | 9.2    | 39.84   | 1280x1024  |    |      |
| My favorite test execu... | Reporting team | 15:43:18 | 21m 1s 12ms  | Samsung Galaxy | 9.2    |         |            |    |      |
| Remote web driver         | John Johnson   | 15:41:54 | 3m 20s 52ms  | Apple iPhone 7 | 9.2    |         |            |    |      |
| Selenium test execution   | John Johnson   | 15:41:18 | 3m 20s 350ms | Windows VM     | 9.2    | 39      | 1280x1024  |    |      |
| Web test execution 123    | John Johnson   | 15:39:18 | 3m 20s 21ms  | Mac            | mac... | 39      | 1280x1024  |    |      |
| Remote web driver         | Reporting team | 15:37:47 | 21m 1s 20ms  | Apple iPhone 6 | 9.2    |         |            | +1 |      |
| Selenium test execution   | John Johnson   | 15:37:28 | 3m 20s 500ms | Windows VM     | 9.2    | 39.84   | 1280x1024  |    |      |
| Web test execution 123    | Oren A         | 15:36:47 | 5m 21s 20ms  | Mac            | mac... | 39      | 1280x1024  |    |      |
| Remote web driver         | Reporting team | 15:35:13 | 3m 20s 19ms  | Apple iPad 9.7 | 9.2    |         |            | +2 |      |


















Web test execution 1234

- Windows VM
- 9.2
- 39.84
- 1280x1024





## Minimum capability: Secure, highly available enterprise-grade lab

|  |   |   |   |  |
|--|---|---|---|--|
|       <p>24/7 N.O.C. ALWAYS-ON</p> |  <p>WI-FI</p>  <p>ANTI-LOCK</p> |  <p>NETWORK EMULATION</p>  <p>CELLULAR COVERAGE</p> |       |  <p>FULL, MANAGED SERVICE</p>  <p>CUSTOMER SUCCESS MANAGER</p> |
| <p>Highly secure global DC, multi-layer monitoring</p>   | <p>Smart self-healing</p>   | <p>Environment control</p>  | <p>Artifact collection</p>  | <p>Same day device delivery</p>  |

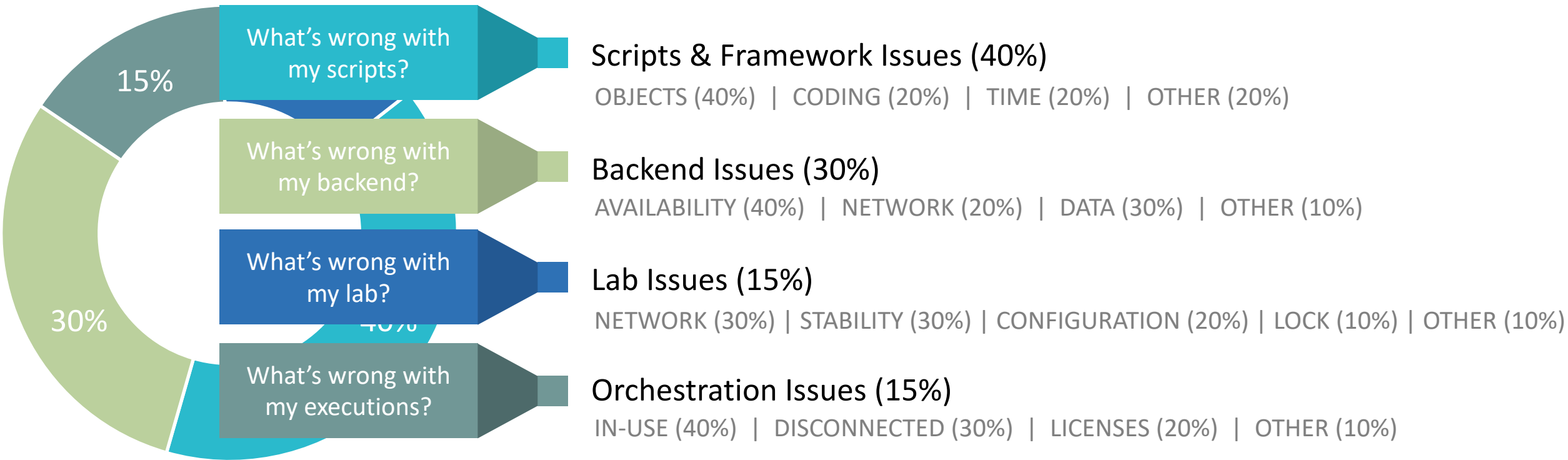
Perfecto: Largest mobile device lab on the planet | Self-healing for always-on devices



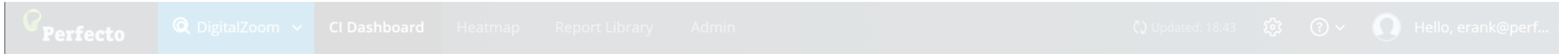
# ANALYSIS

Minimum capability:

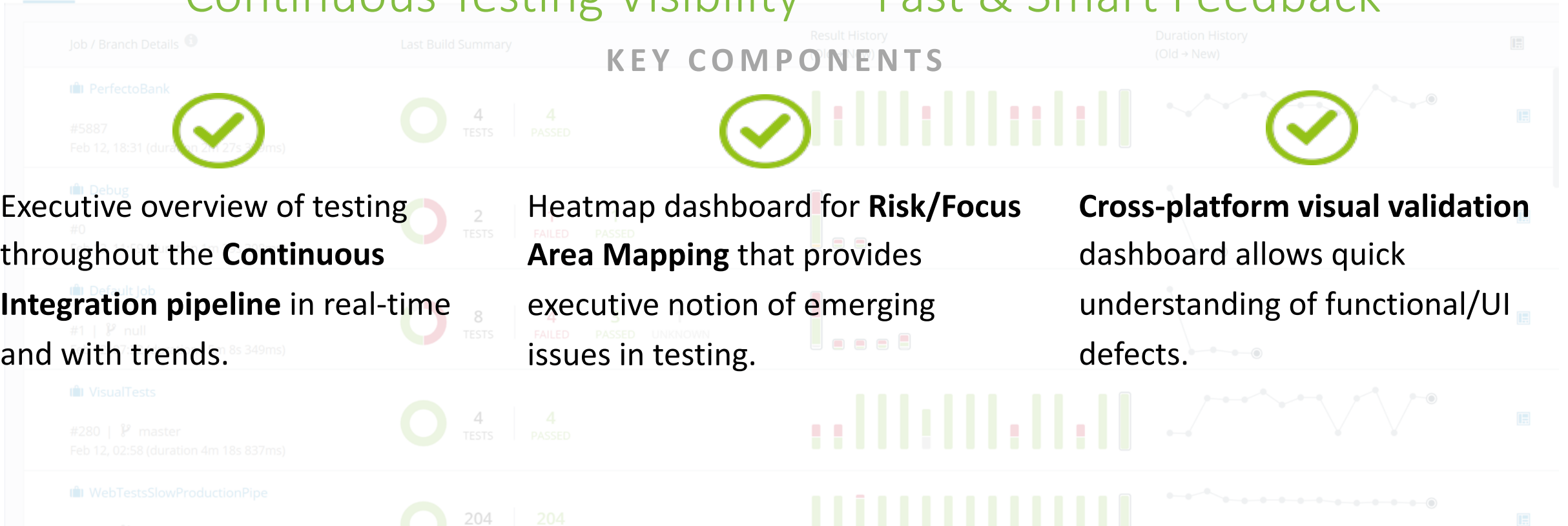
"Single pane of glass" for visibility and fast triaging



# ANALYSIS



## Continuous Testing Visibility — Fast & Smart Feedback



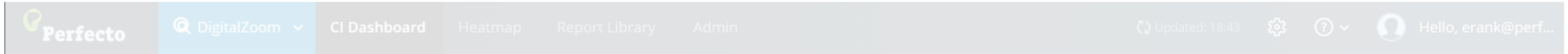
### KEY COMPONENTS

Executive overview of testing throughout the **Continuous Integration pipeline** in real-time and with trends.

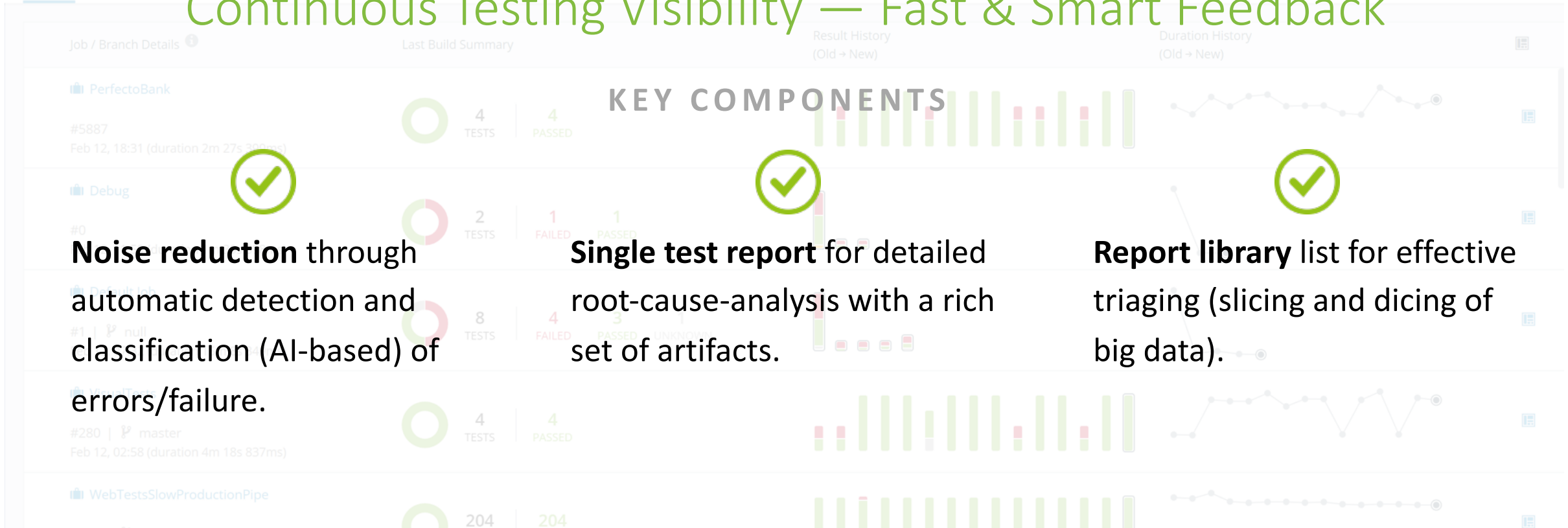
Heatmap dashboard for **Risk/Focus Area Mapping** that provides executive notion of emerging issues in testing.

**Cross-platform visual validation** dashboard allows quick understanding of functional/UI defects.

# ANALYSIS



## Continuous Testing Visibility — Fast & Smart Feedback



### KEY COMPONENTS

**Noise reduction** through automatic detection and classification (AI-based) of errors/failure.

**Single test report** for detailed root-cause-analysis with a rich set of artifacts.

**Report library** list for effective triaging (slicing and dicing of big data).

# Perfecto's Smart Continuous Testing Solution

## Smart Creation

Automation creation that matches your team's skillset (Appium, Espresso, XCUITest, Quantum BDD, Codeless).

## Smart Lab

Always on and stable. Always up to date. Supports all OS and platforms.



## Smart Execution

Fast and parallel test execution with multi-team orchestration abilities and management.

## Smart Analytics

"Single pane of glass" provides visibility and scales to support millions of test results.



24/7 VIP Support



Dedicated Success Manager



Training



Black Belt Testing Experts

# Q&A

THANK YOU  
Get Your Free Trial  
[perfecto.io/free-trial](https://perfecto.io/free-trial)