

Mobile Testing@Google

What's engineering productivity

Scale
Complexity
Connectivity

...



1.0 The Small Beginnings

Google Test in 2005

Culture

Infrastructure

Talent



Test Strategy 1.0

The Model

- Dev/Prod defect ratios
- 99% defect free
- Testing features matrix

Cons

- Lack of tests beyond unit/smoke
- Poor release velocity - 1 or 2 /month
- Lack of granularity of metrics

Challenges *in Scaling!*

Release Strategy 1.0

The Model

- Low frequency: 1 or 2 per month
- Pre-submit tests: Unit + some Smoke tests
- Lots of testing during releases

Cons

- Longer release iterations
- Releases with patches
- Long cycles - features to production
- Many late aborts in the release cycle

Challenges in Scaling!

2.0 Transition to Mid-size...Google Test in 2012

Talent

Infrastructure

Brand

Metrics

Culture - shift in mindset



Evolution of Test Strategy

The Model

- Product Aligned Test Infra
- Cross-functional Tools and Dashboards
- Handling of user data privacy

Pros

- Product excellence
- Bad pattern detection, code coverage
- Customer trust and business compliance : BRAND

Tool Proliferation and Redundancy : Con ... or a Pro



Survival of the fittest!

Metrics and Measurements

Key Indicators

- Releases
- Feature code to Prod time
- ... and many more

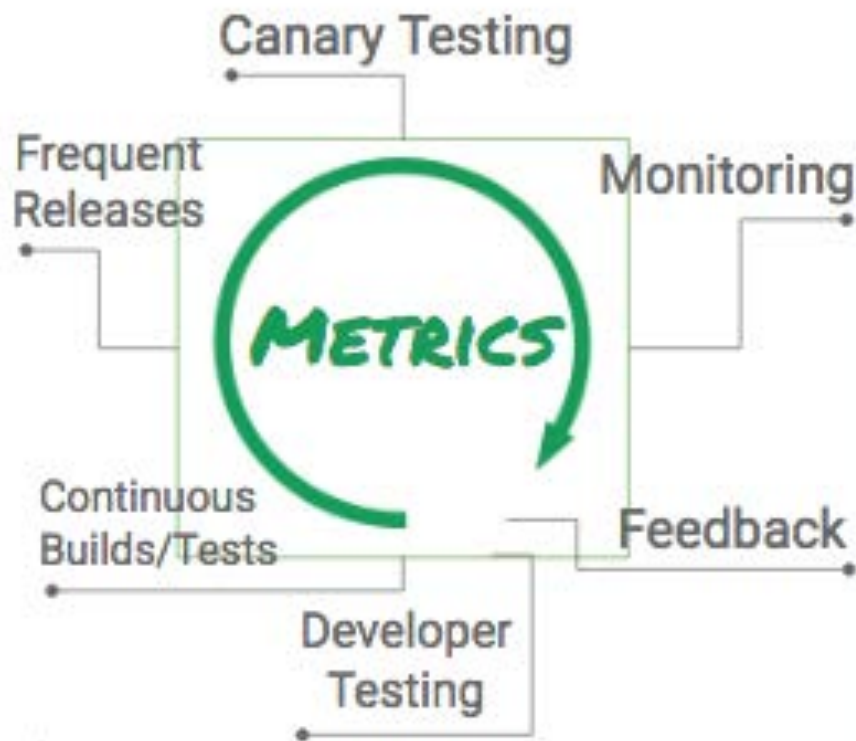
Call to Action

- Instrument the projects
- Metric improvement influences quarterly goals
- Shift in test culture



YOU CANNOT IMPROVE WHAT YOU CANNOT MEASURE.

Test and Release Strategy 2.0



Achievements

- Continuous Deployment
- 5x Increase in release cycle speed
- Avg line coverage ~70%

3.0 Road to the Future ... 2017 and beyond

Next Gen!

Talent

Infrastructure

Brand

• Privacy



Test Strategy: New Challenges

The Model

- Integrated vertical experience
- Data driven eng productivity
- Supporting multiple platforms (mobile, VR,)

Pros

- Awesome user experiences
- Makes engineering friction free
- Follow change in user needs and computing platforms

Android Device Diversity (2015)



~25K distinct Android devices

~680K devices surveyed

~1200 device brands

More on Mobile

Key Needs

- App stability and increased quality
- Faster Releases

... and many more

Call to Action

- Improve developer productivity
- 1 week cycle with best in class tests and monitoring
- Solve challenge with test coverage and giant components.

Mobile Device Infrastructure -- Mobile Harness

Customized Device
Manager



Powerful
Runner



Unified API
and
ecosystem



Standard mobile
devices

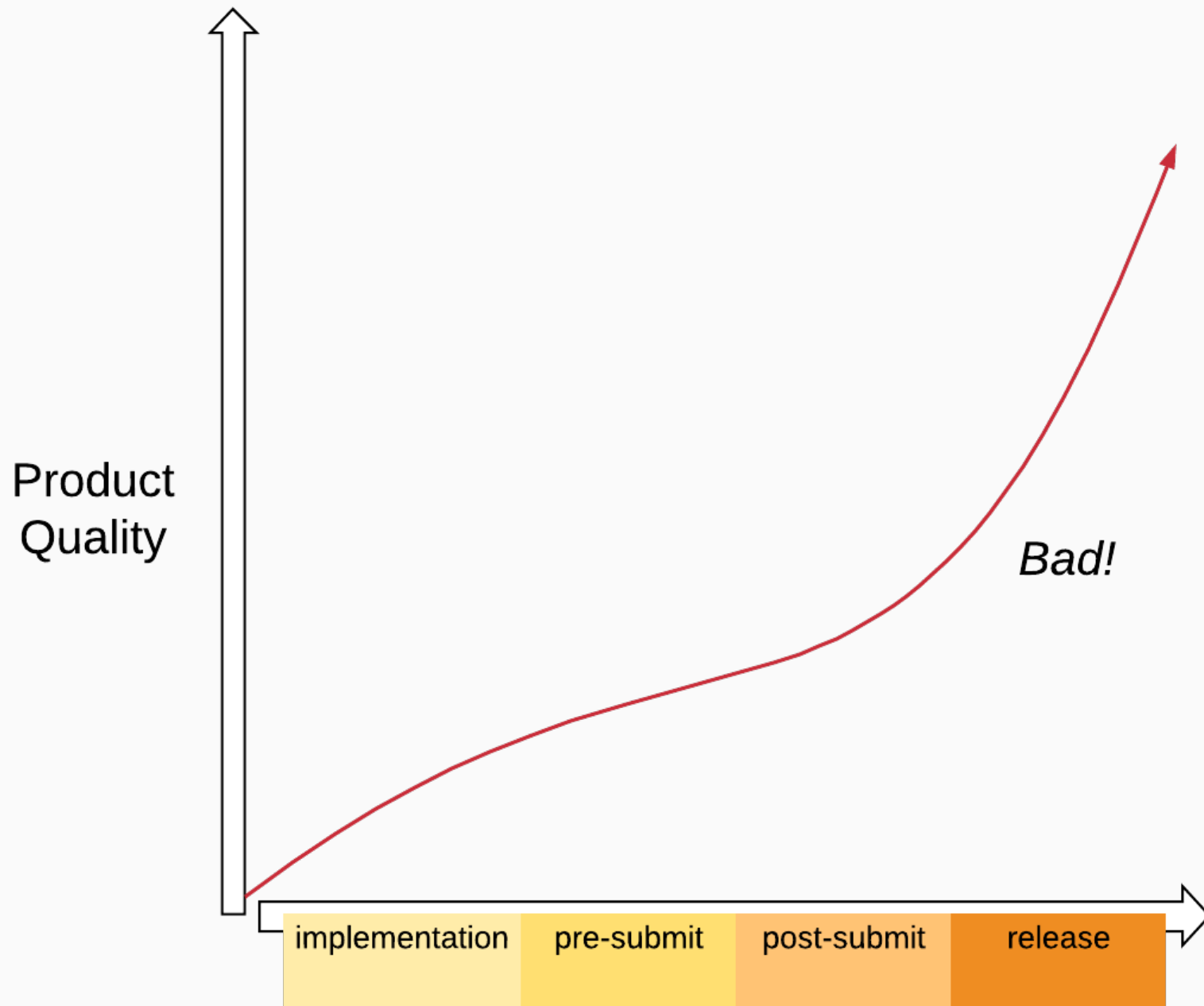
Diverse mobile
devices, smart
home, etc

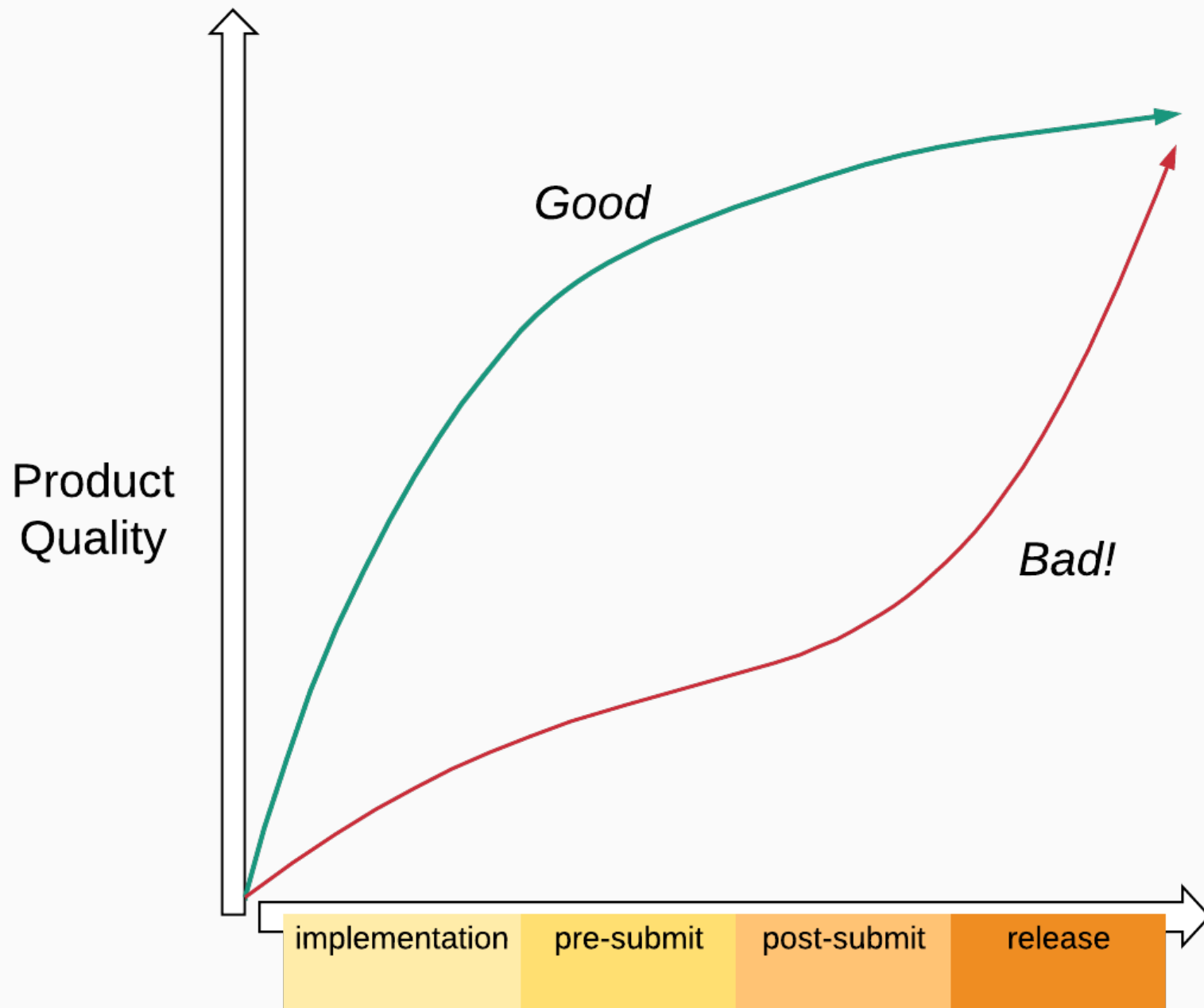
Support mobile apps
customization
needs.

To solve “last-mile”
problems, improve
usability.

Story of Google Mobile Engineers







Challenges

- Running time limit
- Stability: flakiness
- Debugging friendly
- Resource saving

Principle for Finding Solutions

- **Automate everything**

Principle for Finding Solutions

- Automate everything
- **Decouple functions and make each test simple**

Principle for Finding Solutions

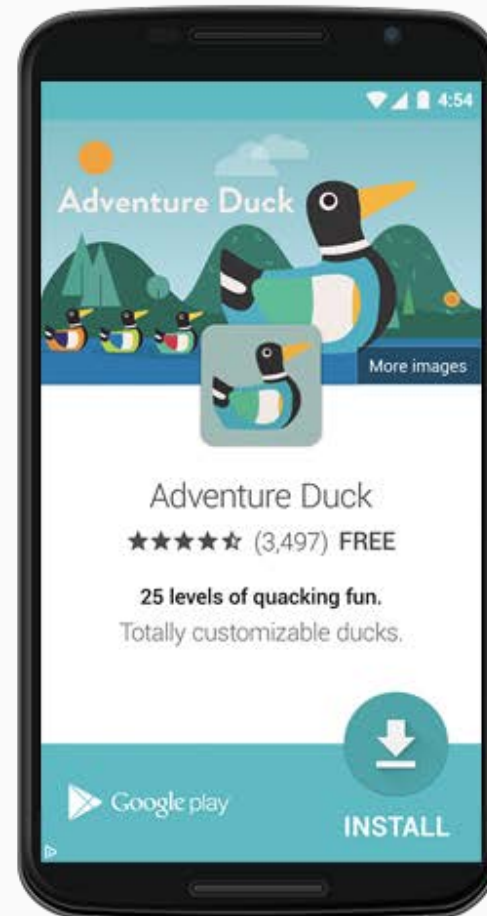
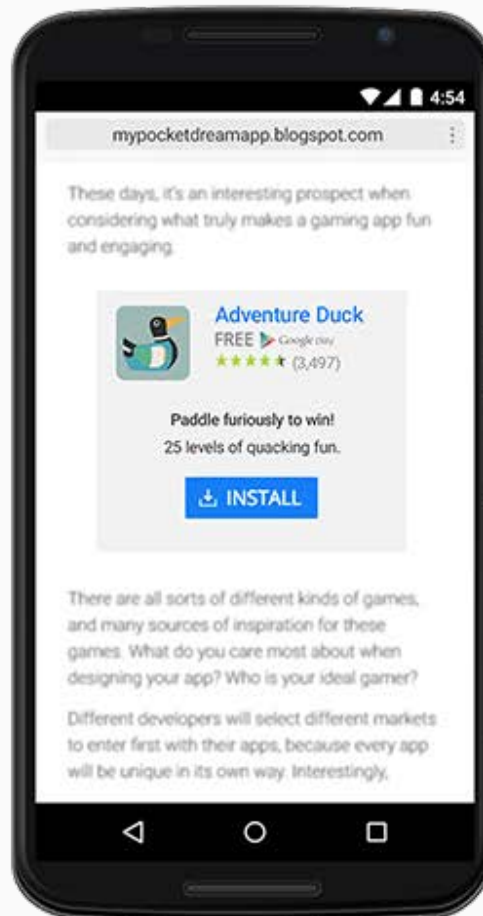
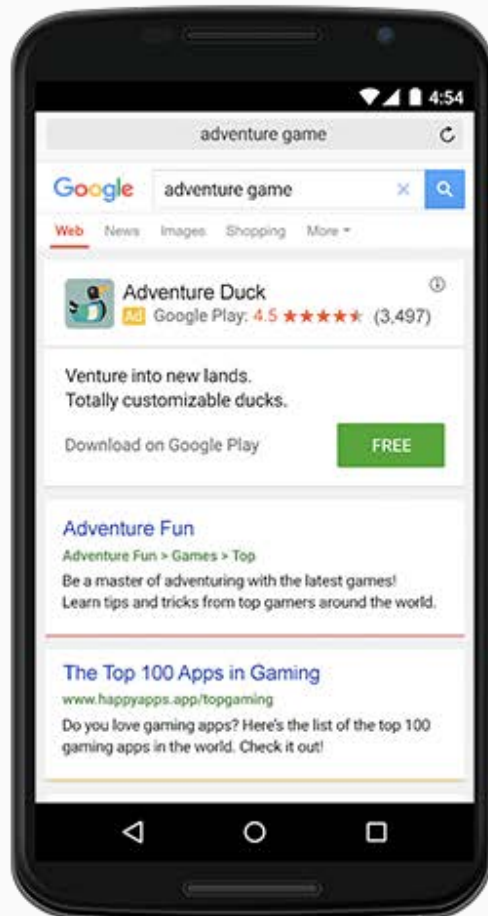
- Automate everything
- Decouple functions and make each test simple
- **Find problems as early as possible**

Principle for Finding Solutions

- Automate everything
- Decouple functions and make each test simple
- Find problems as early as possible
- **Integration with existing framework**

Mobile not necessary on Mobile

Decouple mobile functions with non-mobile functions





Web Server

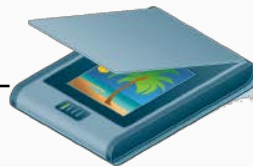
Genete url requests
with different
resolutions



Simulated
Mobile
Browser

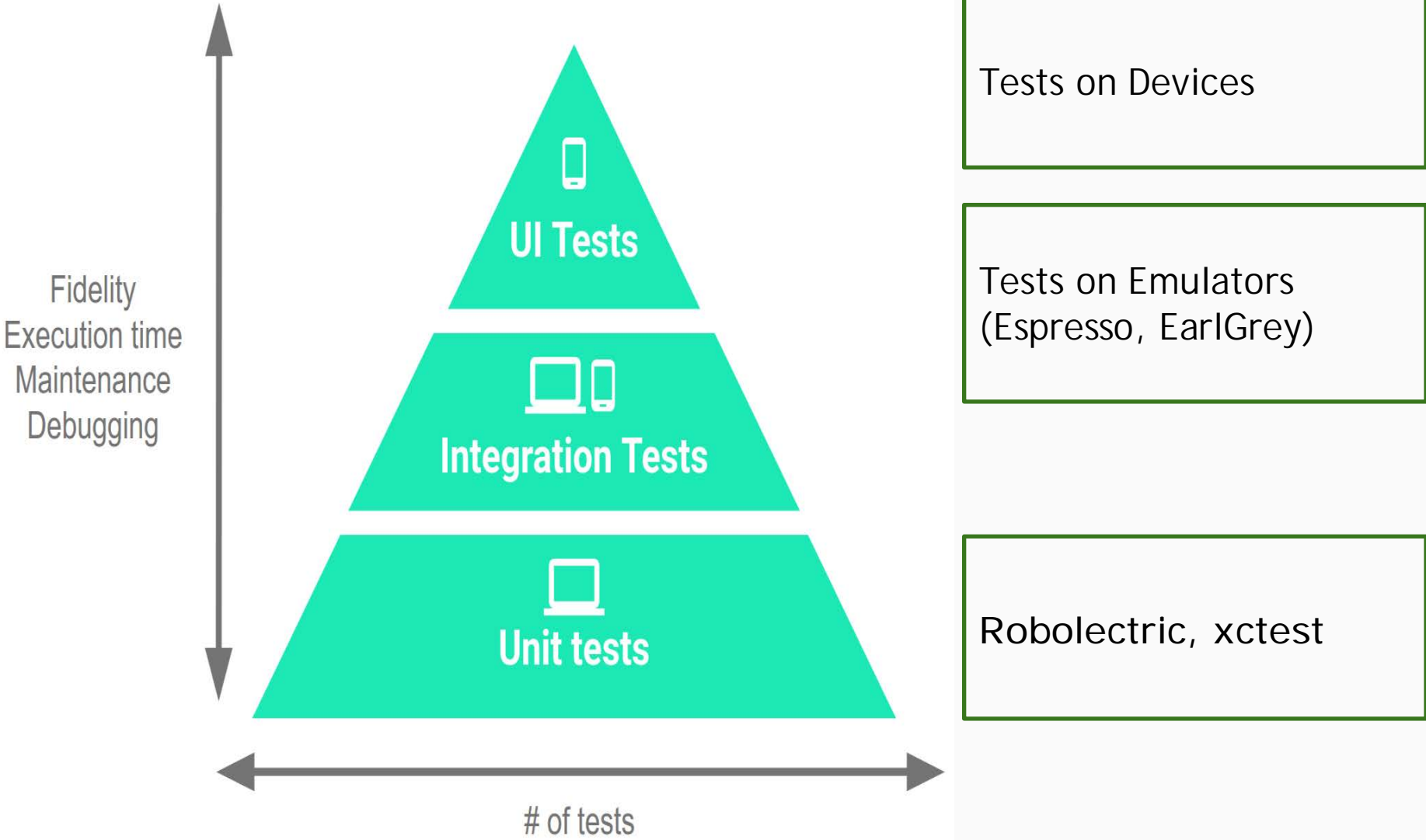


Image Diffing
Service

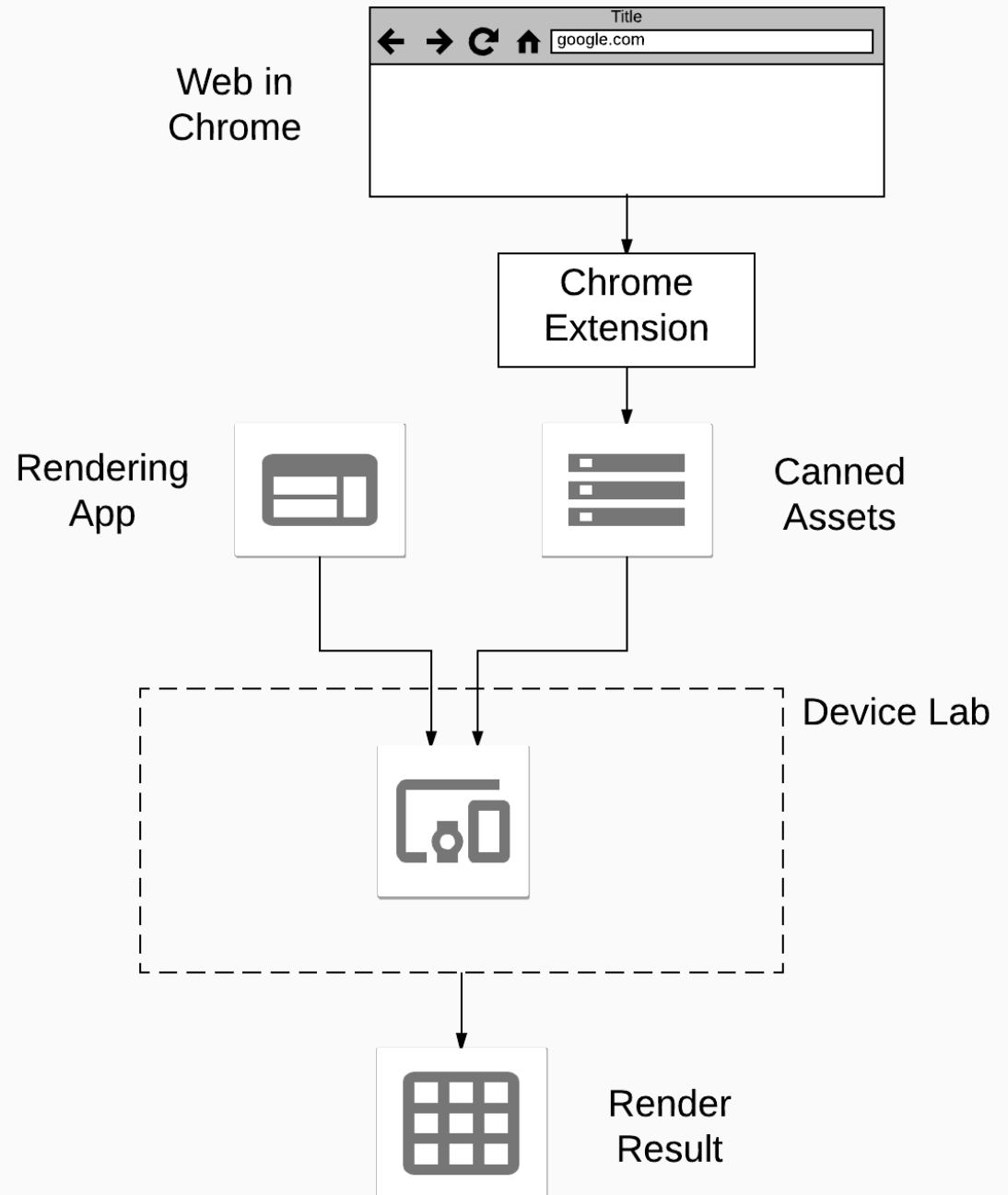



Report





One-click Solution





Color Drops

★★★★☆ (4,005) FREE

Google Play

3 difficulty levels
4 colorful fun skins

INSTALL

Run Ditto

Choose Device Platform

Run on Android and iOS

Debugging Options

- ☐ Do not generate permutations
- ☐ Also Download To Local Disk
- ☐ Use Staging Server

```
<!DOCTYPE html>
<html>
<head>
<body style="background-color: #f0f0f0; font-family: Roboto, Arial, sans-serif; font-size: 16px; margin: 0; padding: 10px;">
<script>
</script>
<div id="video_box">
<div id="start_image" src="//i1.ytimg.com/vi/cJT0Gk00Bhg/mqdefault.jpg" style="display: block; margin: 0px; height: 202px; width: 359px; position: relative; background-color: rgb(0, 0, 0);">
</div>
<div id="video_container" class="container" style="position: absolute; top: 315px; left: 128px; width: 25px; height: 21px; font-size: 21px; font-family: Roboto, Arial, sans-serif; font-weight: normal; font-style: normal;">
</div>
<div id="app_name" data-type="text" dir="ltr" style="width: 105px; position: absolute; top: 315px; left: 128px; height: 25px; font-size: 21px; font-family: Roboto, Arial, sans-serif; font-weight: normal; font-style: normal;">
</div>
<div id="app_store" data-type="image" style="position: absolute; top: 399px; left: 136px; width: 80px; height: 22px;">
</div>
<div id="content_background" data-type="shape" style="position: absolute; top: 202px; left: 0px; width: 360px; height: 437.525px; background-color: rgb(206, 93, 163);">
</div>
<div id="description" style="font-family: Roboto, Arial, sans-serif; font-weight: 300; font-style: normal; font-size: 18px; position: absolute; top: 474px; left: 103px; width: 154px; height: 28px;" data-type="text" dir="ltr">
</div>
<div id="headline" style="font-family: Roboto, Arial, sans-serif; font-weight: 500; font-style: normal; font-size: 18px; position: absolute; top: 443px; left: 113px; width: 134px; height: 28px;" data-type="text" dir="ltr">
</div>
</div>
```

html body #ad_container #adContent #video_box img#start_image

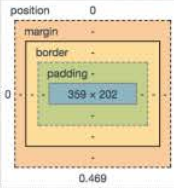
Styles Event Listeners DOM Breakpoints Properties

Filter :hov .cls +

```
element.style {
display: block;
margin: 0px;
height: 202px;
width: 359px;
}
```

#s video_ctd_wonde_and_v3.css:201

```
ta
rt_image {
display: none;
height: 100%;
left: 0;
position: absolute;
top: 0;
width: 100%;
z-index: 5;
transform: translate3d(0, 0, 0);
-webkit-transform:
```



Filter Show all

- background-attach scroll
- background-clip border
- background-color rgba
- background-image none
- background-origin padding

Ditto Execution Result

THUMBNAIL VIEW

Executing Rendering Test (avg 5 min) Time: 00:02

Finished jobs: 0 / 27



Running...

Test Logs: Processing...

Cached Files: [Redacted]

Platform Filter

- ☒ All Devices
- ☐ Android
- ☐ iOS

Orientation Filter


- ☒ All Devices
- ☐ Portrait
- ☐ Landscape

Device Filter


- ☒ All Devices

Ditto Execution Result


DEVICE VIEW




Nexus 5




Nexus 5X




Pixel




Nexus 5




Nexus 9




Nexus 5




Pixel XL




Nexus 4




Nexus 5




Nexus 7




Nexus 5




iPhone 6s




iPhone 5s




iPhone 6Plus




iPhone 5s




iPhone 7




iPhone 6sPlus



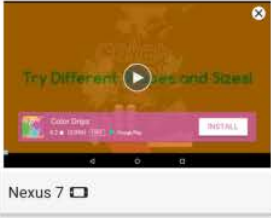
iPad Mini




iPad Air2




iPad Air



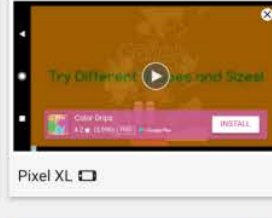
Nexus 7




Nexus 5




Nexus 5X




Pixel XL




Nexus 5




Nexus 5




Nexus 4



Pixel



Nexus 5



Pixel

Execution Complete

Test Logs:

Platform Filter

- All Devices
- Android
- iOS

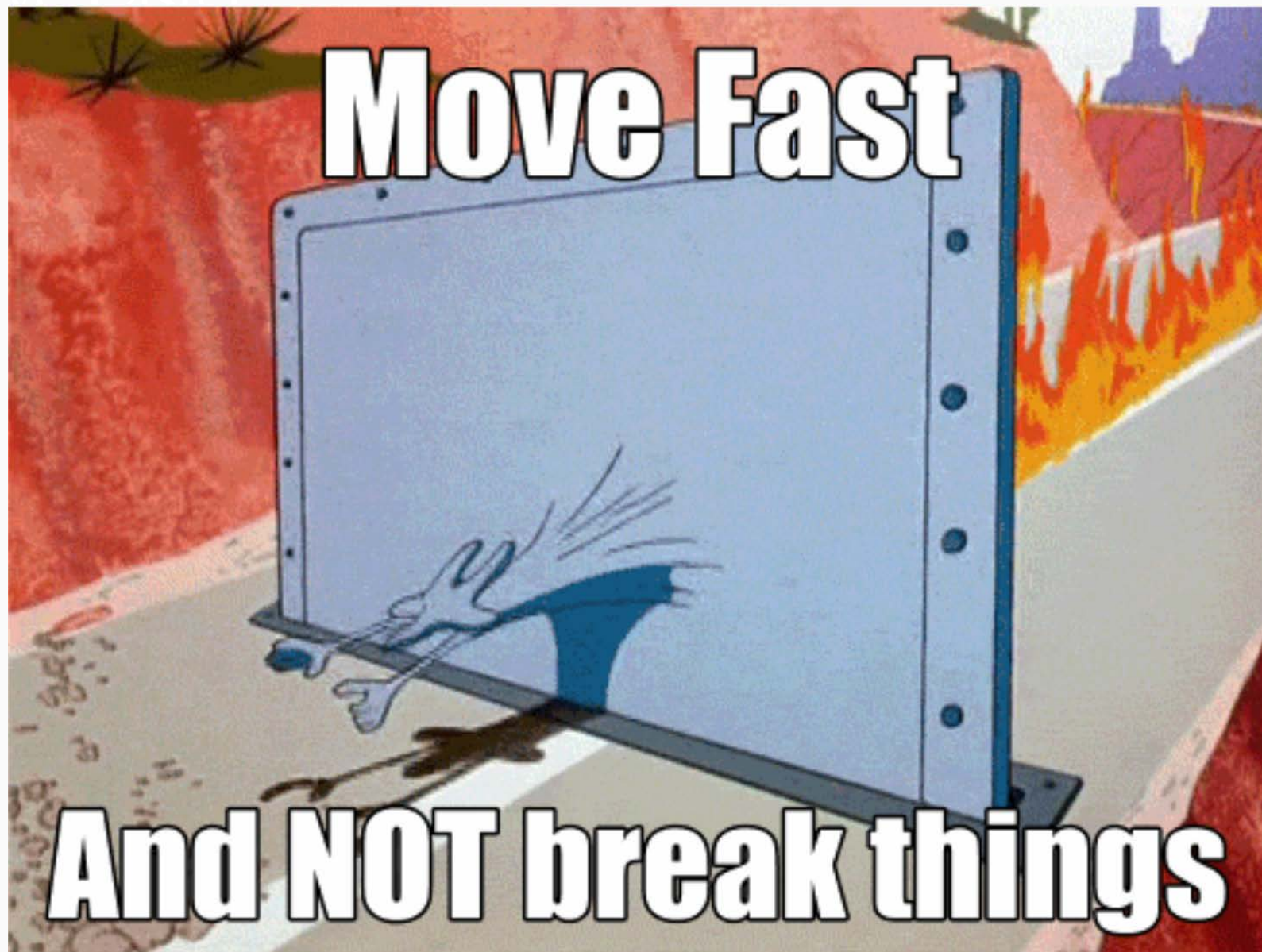
Orientation Filter

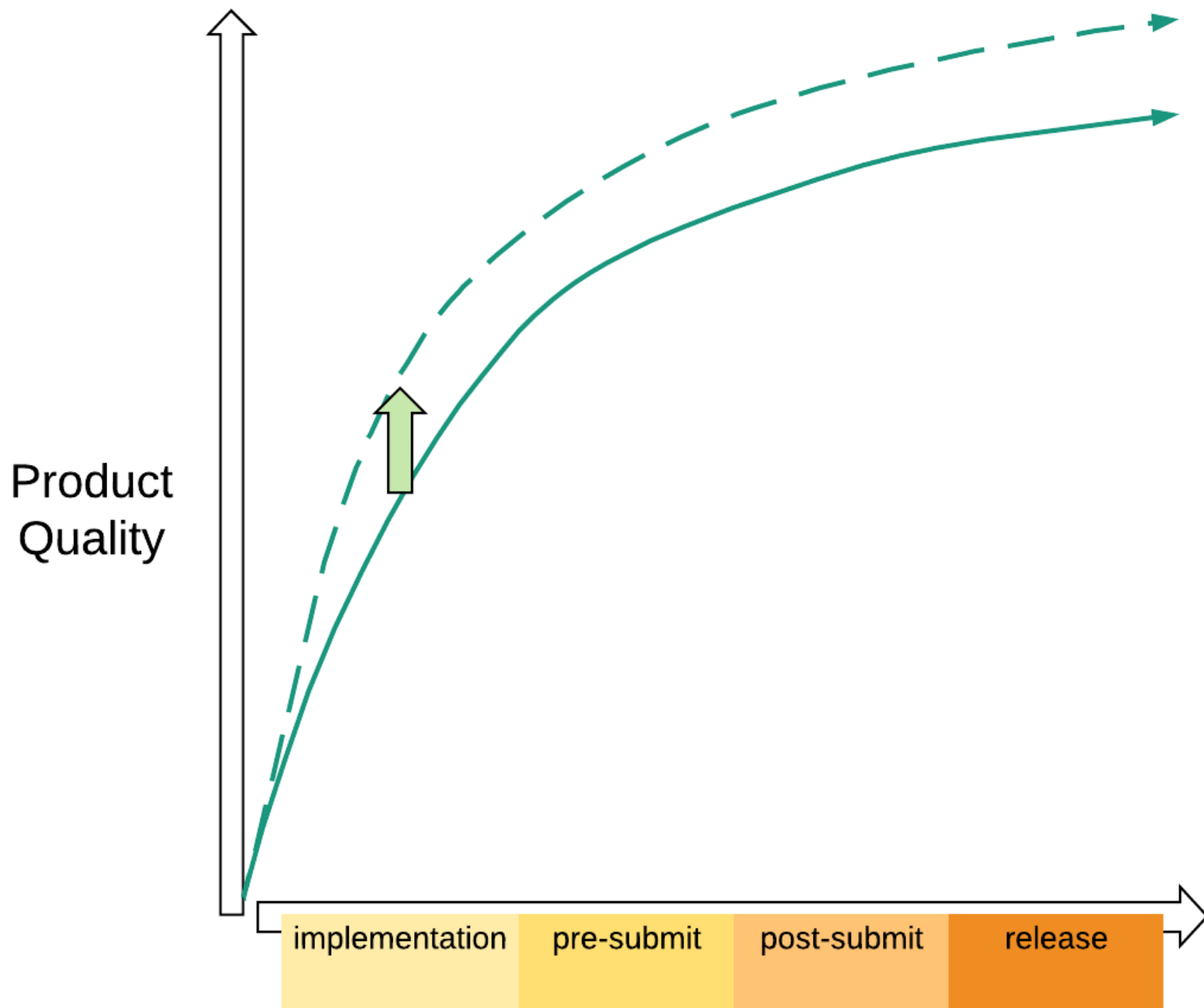
- All Devices
- Portrait
- Landscape

Device Filter

- All Devices
- iPad Air
- iPad Mini
- iPad Air2
- iPhone 5s
- iPhone 6Plus
- iPhone 6s
- iPhone 6sPlus
- iPhone 7
- Nexus 4
- Nexus 5
- Nexus 5X
- Nexus 7
- Nexus 9
- Pixel
- Pixel XL

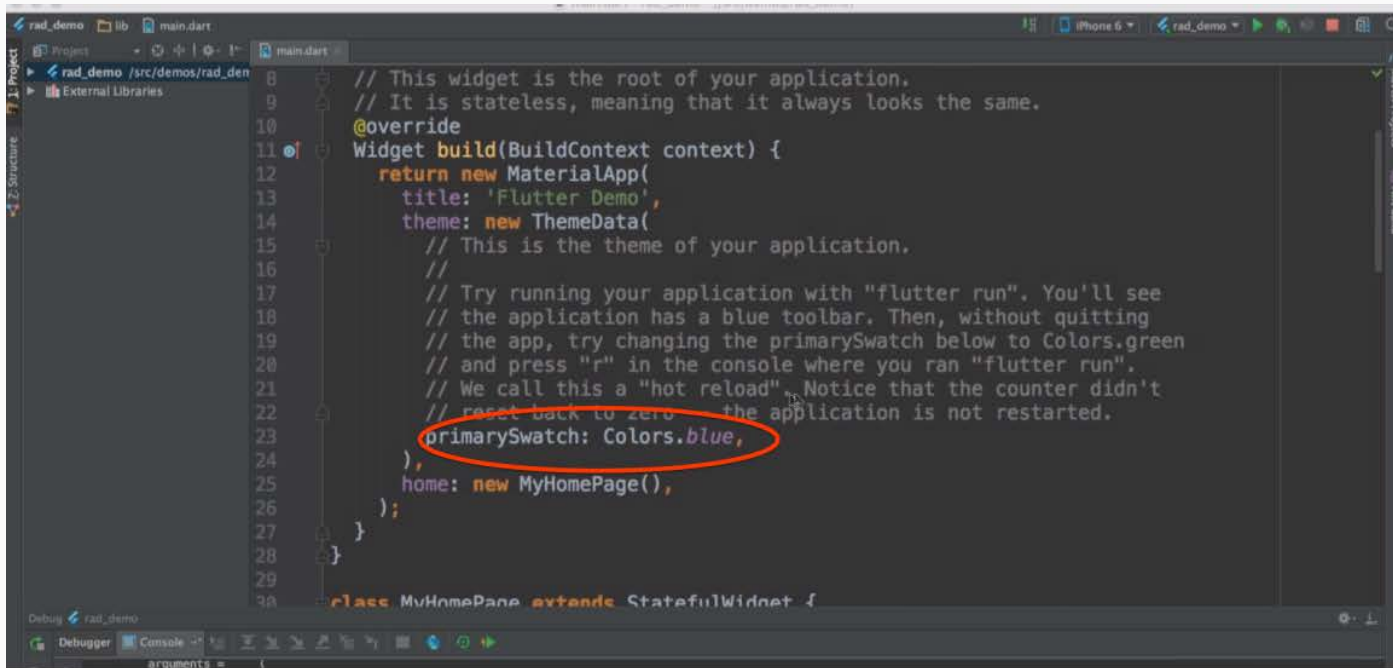
Move Faster



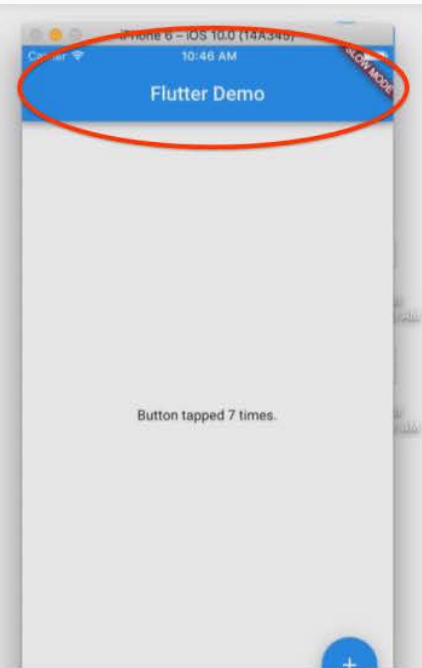


Interactive Development

- Instant Run - Android Studio 2.0
- Flutter



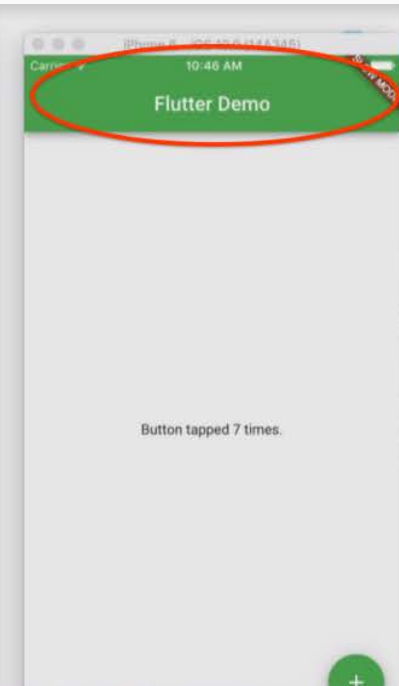
```
8 // This widget is the root of your application.
9 // It is stateless, meaning that it always looks the same.
10 @override
11 Widget build(BuildContext context) {
12   return new MaterialApp(
13     title: 'Flutter Demo',
14     theme: new ThemeData(
15       // This is the theme of your application.
16       //
17       // Try running your application with "flutter run". You'll see
18       // the application has a blue toolbar. Then, without quitting
19       // the app, try changing the primarySwatch below to Colors.green
20       // and press "r" in the console where you ran "flutter run".
21       // We call this a "hot reload". Notice that the counter didn't
22       // reset back to zero; the application is not restarted.
23       primarySwatch: Colors.blue,
24     ),
25     home: new MyHomePage(),
26   );
27 }
28
29 class MyHomePage extends StatefulWidget {
```



```
rad_demo  lib  main.dart
Project  rad_demo /src/demos/rad_demo
External Libraries

main.dart
8 // This widget is the root of your application.
9 // It is stateless, meaning that it always looks the same.
10 @override
11 Widget build(BuildContext context) {
12   return new MaterialApp(
13     title: 'Flutter Demo',
14     theme: new ThemeData(
15       // This is the theme of your application.
16       //
17       // Try running your application with "flutter run". You'll see
18       // the application has a blue toolbar. Then, without quitting
19       // the app, try changing the primarySwatch below to Colors.green
20       // and press "r" in the console where you ran "flutter run".
21       // We call this a "hot reload". Notice that the counter didn't
22       // reset back to zero -- the application is not restarted.
23       primarySwatch: Colors.green,
24     ),
25     home: new MyHomePage(
26       // green
27       // greenAccent
28       // lightGreen
29       // lightGreenAccent
30     );
31   );
32 }

class MyHomePage extends StatefulWidget {
  // Dart-VM/src/flutter/packages/flutter/bin/loader/loader_app.dart
```





覆盖全国 **25** 城市

Google Developers 一年**400+** 场线下技术分享活动



30,000+ 开发者参与

120,000+ 开发者关注



Q&A