The More Things Change (Location)

Best Practices Evolve and Abide in Mobile Testing

RBCS

TIME TESTED.
TESTING IMPROVED.

www.RBCS-US.com

Introduction

- Mobile computing and mobile phones have changed and merged since the 1960s
- Mobile apps have changed how we use computers
- PC use continues to grow, but people spend relatively more time on mobile apps
- Mobile apps are different than PC apps in important ways
- Testing changes in response to these differences, but not everything is different
- What changes, and what doesn't change, when you move into the mobile world?
- Let's take a look…

Testing Mobile: What's the Same?

- Test techniques and considerations
  - Black-box, white-box, etc.
  - Test automation, especially regression testing
  - Test data management and test environment management
- Bugs are everywhere
  - No evidence that mobile apps are less buggy than other software
  - Simple doesn't mean "won't fail"
- It's not just about functionality
  - Usability, performance, and reliability are critical
  - Testing must address these issues
- Safety-critical and mission-critical apps need special attention
  - Don't test such apps less just because they are mobile
  - If anything, such apps might be used in more critical settings
- Skills growth a constant consideration
  - Technology changes rapidly
  - Test tools are evolving

 Copyright (c) 2016-2017 RBCS

Testing Mobile: What's Different?

- So, does everything stay the same? No, some things are different:
  - Sensors affect behavior
  - Connectivity changes
  - Radios are weird
  - Extreme interoperability
  - Battery and power management
  - CPU, memory, and storage limits
  - Updates, updates, all the time
  - Interaction with the real world
  - Interaction with the user
  - Rate of technological change
- Let's take a closer look at each of these areas and how they affect testing…

 Copyright (c) 2016-2017 RBCS

Sensors Affect App Behavior

- Some mobile apps can use sensors directly (e.g., heartrate, accelerometer, GPS)
- Some apps affected indirectly by sensors (e.g., device orientation)
- Peripherals such as keyboards, screens, etc. may also be used
- For testing
  - Identify sensors and peripherals used directly and indirectly
  - Apply equivalence partitioning and boundary value analysis to keep test configurations reasonable
  - Apply risk analysis to further trim configurations if needed

 Copyright (c) 2016-2017 RBCS

Connectivity Changes

- Some apps rely on connectivity to work, and some change their behaviors based on connectivity state
- The type of connectivity can affect behavior (e.g., WiFi vs. mobile)
  - Mobile connectivity can vary in terms of generation, speed, data restrictions
  - WiFi connectivity can also vary
- Connectivity can change mid-transaction
- Decision tables, use cases, state-based testing, and even pairwise testing can be used to detect connectivity/app issues
- Apps meant to be used in motion should be tested in motion for connectivity change issues, if relevant

 Copyright (c) 2016-2017 RBCS

Radios Are Weird

- Radios in mobile devices include the cellular network, WiFi, Bluetooth, NFC (RFID), and possibly others
- Radios and radio signals exhibit behaviors that can be perplexing to people used to dealing with PC apps
  - Signal strength variation
  - Faraday cages (e.g., elevators, metal roofs)
  - Line-of-sight
  - Rayleigh and Rician fading (e.g., cell signal in "street canyon")
  - Signal travel limitations
- When testing apps that use radios for input or output, understand the underlying technology
- If app use cases include in-motion use (e.g., navigation), test across multiple in-motion scenarios with various user personas

Dr. MegaVolt in a Faraday Cage

Copyright (c) 2016-2017 RBCS

Little Conversations Inside Outside Always

- PC apps are often either standalone or interact in limited ways
  - Word processor (copy-paste)
  - E-mail app (SMTP/POP)
- Mobile apps often have extreme interoperability
  - With multiple other apps on device
  - With OS and device capabilities (e.g., sensors and cameras)
  - With services and protocols on Internet
  - With other devices via radios or other transmitter/receiver (e.g., infrared)
- Use equivalence partitioning to identify all interfaces and all ways your app interoperates (send/receive, passive/active, request/respond)
- Use fuzzing on app's incoming interfaces
- Use equivalence partitioning and boundary value analysis on communication interruptions, signal attenuation, throughput changes, etc.

Copyright (c) 2016-2017 RBCS

How Lithium Affects Everyone's Mood Now

- Thirty years ago, if you knew about lithium, it was usually the pill form
- Now, lithium rules the (battery) world, and people get depressed when their lithium discharges
- Battery, heat, and power management issues are significant
- Test apps under various power and power management conditions
- For outdoor-use apps, consider temperature conditions
- If changing conditions can enable/disable features in your app, test for changes between and during operations
- Decision tables, use cases, and state-based tests can be useful

 Copyright (c) 2016-2017 RBCS

What a Cute Little Processor You Have

- CPU, memory, and storage are limited relative to PCs
- A typical Windows PC has 2x CPU power than a mobile phone
- Moore's law for mobile devices, especially CPUs, is limited by power and heat issues
- Power management features tend to throttle CPU performance when engaged
- Test device-side performance and reliability for native and hybrid apps, especially under conditions of:
  - Multiple active apps
  - Power management and heat stress

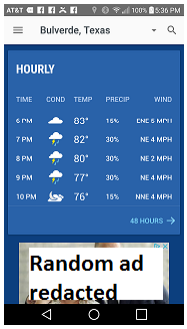
 Copyright (c) 2016-2017 RBCS

Hit By a Water Cannon of Updates

- Updates, updates, all the time
  - Your apps are probably on a hamster wheel of upgrades, due to competitive pressures
  - Even if your apps aren't changing all the time, interoperating apps are
- You need automated regression tests
- If you can't create maintainable regression tests at the GUI, consider command line, API, and even data approaches
  - Tcl/Tk scripting available for Android
  - Remember the perfect is the enemy of the good
- Simulators, outsource test labs, and crowdsourcing also options

Responsive to the Outside World

- Some apps are subject to interaction with and interruptions from the outside world
  - News and weather updates and alerts
  - Social media
  - Messages and phone calls
  - Navigation software
- Use equivalence partitioning, decision tables, state-based, and use case testing
- Can intersect with connectivity and power management, so consider pairwise testing of such conditions with interactions and interruptions



Poke Spread Pinch Swipe Poke

- Not since the invention of the GUI has interaction with the user changed so much
- More like tickling a baby than pounding a typewriter
- Input validation testing must not only consider equivalence partitions and boundary values of inputs, but must also cover equivalence partitions of the different ways inputs can occur
- For inputs that are interruptions, consider the issues on the previous slide
- Usability testing is critical, especially given screen size, soft keyboards, etc.

 Copyright (c) 2016-2017 RBCS

Even the Second Derivative Is Increasing

- Mobile apps consume a greater percentage of users time
- The total number of hours spent on mobile apps worldwide is following an exponential rate of growth
- The number of apps of similar types is growing
- However, the number of new types of apps is growing, too
- This means that the accelerating rate of technological change will mean new testing challenges for the foreseeable future

Time Spent per Adult User per Day with Digital Media, USA, 2008-2015

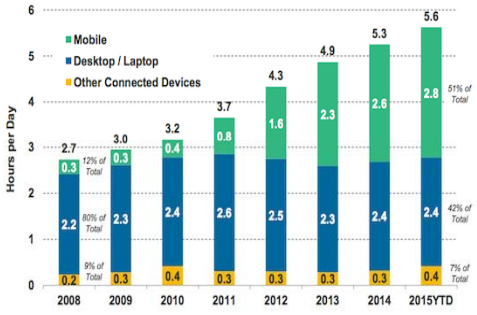


Figure from businessofapps.com

 Copyright (c) 2016-2017 RBCS

Conclusion

- In many ways, testing of mobile apps is still just testing
- Many best practices apply unchanged
- However, mobile-specific considerations are important and change the way apps must be tested
- If anything, mobile apps have more potential dimensions of testing than similar PC apps
- Expect continuous, disruptive change
- Apply and extend testing best practices

 Copyright (c) 2016-2017 RBCS

…Contact RBCS

For over twenty years, RBCS has delivered consulting, training, and expert services to organizations that want to improve their software and hardware testing. Employing the industry's most experienced and recognized consultants, RBCS assesses test teams, manages testing projects, builds and improves testing groups, and provides test experts for hundreds of clients worldwide. Ranging from Fortune 20 companies to start-ups, RBCS clients save time and money through improved system development, decreased failures in production, improved corporate reputation and more. To learn more about RBCS, visit www.rbcs-us.com.

Address: RBCS, Inc.
31520 Beck Road
Bulverde, TX 78163-3911
USA
Phone: +1 (830) 438-4830
E-mail: info@rbcs-us.com
Web: www.rbcs-us.com
Twitter: @RBCS, @LaikaTestDog
Facebook: RBCS, Inc

 Copyright (c) 2016-2017 RBCS