Can a Mobile Device Save Your Life?

Testing, Quality, and Ubiquitous Computing

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Introduction

- Mobile phones have come a long way since the 1960s
- With the right software, today's phone could land a man on the moon with CPU cycles to spare
- It's also a multi-band two-way radio, a GPS location device, and possibly even a health monitor
- What are the safety implications of mobile devices?
- How does mobile computing interact with crime, fraud, privacy, security, and encryption?
- What are the testing and quality implications of this modern, mobile world?
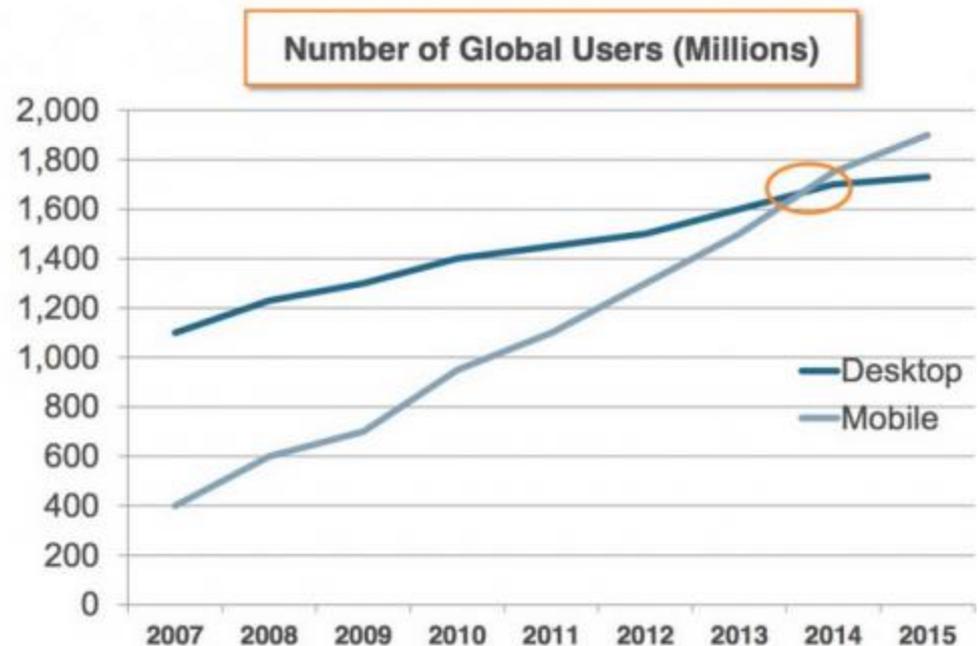- Let's take a look…

When I Was a Lad…

- Back in the 1960s, we had spacecraft and we had mobile phones, but…
- "Omigod I'm at 5%!" referred to the car's battery (phones drew 250 watts)
- Apollo Guidance Computer had
  - 4 KB RAM
  - 72 KB (read-only) storage
  - 2 MHz, 16-bit, single-core CPU
- My current phone has
  - 3 GB RAM
  - 32 GB built-in storage + 128 GB SD storage
  - 1.8 GHz, 64-bit, six-core CPU
- Yes, I'm a dinosaur

Mobile, Mobile, Everywhere

- From humble beginnings, mobile is now everywhere
- Mobile users outnumber desktop users
- Hours of mobile app usage outnumbers desktop app usage
- If you're not testing mobile apps yet, you will be soon
- If your company's not mobilized yet, it is behind
- If you're not ready to test mobile apps yet, you risk obsolescence

Number of Global Users (Millions)

Desktop
Mobile

2007 2008 2009 2010 2011 2012 2013 2014 2015

A Lifeline to the Real World

- In some refugee camps, people will trade food for money
- The money is often used to pay mobile phone bills
- The mobile phone serves as link to the outside world
- People can use the phone to check status of others, send messages to each other, gain information on how to manage their status
- Consider Twitter use during Arab Spring
- Social media and messaging applications should be tested with such use cases in mind
- What uses for your app might emerge?

Electronic Credit Card?

- ✦ Apple Pay and Android Pay use near-field communication to make payments
- ✦ Actual credit card info isn't transmitted
- ✦ However, encryption is necessary to keep transaction secure
- ✦ Beyond the pay-side issues, such technology puts private information in hands of Apple, Google, and whoever comes next
- ✦ Testing should look at both the pay-side and back-end security
- ✦ Back-end privacy is also a concern (e.g., purchases of sensitive items)
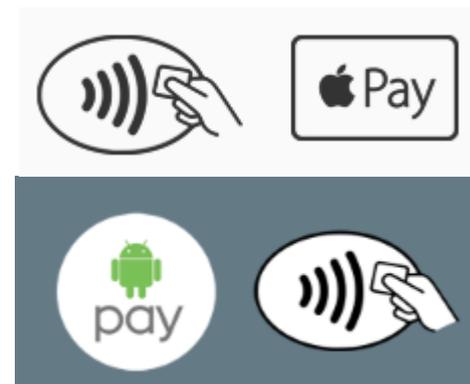
Privacy and Security

- Mobile phones are increasing the target of malware and malvertising
- Sloppy security on the phone can enable misuse of payment features
- People often post personal information on social media without considering who will see it
- Testing of apps should include privacy and security, and how easy it is to use those privacy and security features
- Note: making privacy and security the default isn't enough
- Now, if we can get people to avoid doing and posting stupid and embarrassing things….

Gathering, Managing Health Information

- From NIH website: "Mobile healthcare information management utilizing Cloud Computing and Android OS"
- Hey, what could go wrong with that?
- This is just one of over 10,000 mobile apps handling health-related information
- One of our clients uses health-care management software, some of which runs on mobile devices
- Test for:
  - Regulatory compliance (e.g., HIPAA and FDA in US)
  - Security and privacy, especially in transit
  - Accuracy of gathered data (e.g., Theranos problem)
  - Mobile device realities and data collection

Encryption

- When terrorists shot dozens in California, the FBI got a cell phone
  - A brouhaha ensued where Apple refused to help break encryption
  - A company claimed to have done it for the FBI later
  - Did the FBI really hack it?
- The entire modern Internet is based on the idea of secure encryption (e.g., PKI)
- Special expertise in encryption, PKI, certificate management, and the like is needed to test apps that rely on encryption for security
- Security is a smart career path for testers

Digital Breadcrumbs

- If left on, your mobile phone makes it possible to track your every move
- Do you care?
- You do if you're a terrorist, but even good IT OpSec wasn't enough for Osama Bin Laden
- Allegedly a courier's momentary lapse contributed to his location
- Now, tracking individuals via mobile devices is expanding to law enforcement usage in active scenarios
- Test for:
  - Sufficient accuracy
  - Possible mistaken identity (deliberate or accidental)
- The possibilities, sadly, are endless…

Deceased

"You Could Use a Guinness John Anderton"

- In Minority Report, the mark was identified by iris scan
- Since we all carry tracking devices (aka mobile phones) now, why bother with irises?
- Google, for one, is working on such custom advertising
- Unclear on the concept? Think the targeted ads you see in your browser, only flashed on a public screen
- Now are you worried?
- Test for things like:
  - Embarrassing products
  - Health-status divulgence
  - Safety issues (e.g., outing police or security agency officers)
- Equivalence partitioning and personas will be key to such tests

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"But Surely We Can Trust Them?"

- No, surely you cannot, at least not to have your best interests as a priority
- A silly example: Uber, the mobile ride app, and their "rides of glory" analysis
- Mobile phone makers and mobile phone software makers are companies
- Companies exist to maximize profits within legal constraints imposed by governments
- So, barring legal constraints, if they can make money selling or using information about their users, they will
- Remember: if you're not paying for it, you're the product, not the customer
- When testing an app, consider how you would feel as a customer, knowing how data is handled
- Look for scenarios where user data handled questionably
- Consider ethical issues when testing handling of user data

A Polyglot, Garrulous, Indiscreet Companion

- Mobile phones have more and more interfaces, both open and proprietary
- NFC, Bluetooth, WiFi, cellular, etc.
- Making the device talk openly is often seen as a plus (which it is for increased functionality but not security)
- Devices often try to communicate (unless told to shut up by disabling communication channels)
- People's ignorance of basic security leads to indiscreet information risks
- Test your apps to see if they transmit information that might be sensitive
- Test your apps to see if they are guilty of TMI with the broader world
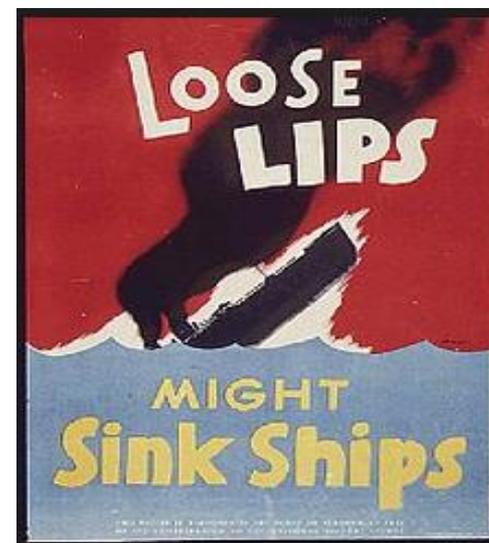
That Damned Thing's Gonna Kill You!

- Cancer scares have long history
- US NIH: "no consistent evidence…non-ionizing radiation increases cancer risk"
- Violent theft of phones gets media attention, but is rare
- Phone theft in general is down due to "kill switch" technologies
- As usual, it's the boring stuff that kills:
  - Distracted driving: about 10,000 deaths and 1,000,000 injuries per year in US
  - Distracted walking: 1000s of deaths and 10,000s injuries per year in US
- If mobile devices try to intuit distraction, we must be ready to test such features—safely

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

Testing Mobile: What's Different?

- Sensors affect behavior
- Connectivity changes
- Radios are weird
- Extreme interoperability
- Battery and power management
- Rate of technological change
- CPU, memory, and storage limits
- Updates, updates, all the time
- Interaction with the real world
- Interaction with the user

Conclusion

- Mobile devices have come a long way, especially in the last decade
- Mobile apps can provide convenience, entertainment, and even support health and safety
- However, there are risks that must be addresses through testing
- Testing of mobile apps is both the same and different as testing PC apps
- Smart test professionals should know the risks and position themselves to be ready to test mobile apps

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