Mobile Application Testing
SE 3S03 - Tutorial 1

Zahra Ali

Department of Computer Science
McMaster University
naqvis7@mcmaster.ca

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Outline

Mobile
Application
Testing

Zahra Ali

How to test mobile
apps
Mobile App testing vs
Software Testing
User Expectations
Things to keep in
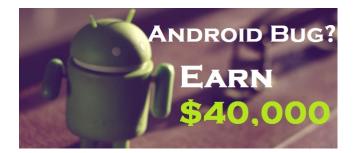mind

Mobile Devices
and Applications
Mobile Networks
Mobile Devices and
the year 2007
The Big Two
Smartphone
Components
Types of Applications
Business Models of
Mobile Applications
App Stores

Challenges in
Mobile App
Testing
Challenges in Mobile
App Testing
The Customer
Mobile Device
Fragmentation
Sensors and Interfaces

Google Bug Bounty Program!!

Google Bug Bounty Program!!

Introduction

- ► Emulator

Introduction

- ▶ Emulator

  - ▶ A process by which a developed application for a mobile is tested for its functionality, consistency and usability

Mobile App testing vs Software Testing

- ▶ 99.5 percent access content/information
- ▶ 63.1 access the Internet
- ▶ 62.1 percent check email
- ▶ 49.2 percent listen to music
- ▶ 46 percent play games
- ▶ 41.7 percent download and use apps
- ▶ 15 percent make purchases
- ▶ 15 percent read a book

User Expectations

- Avg. user checks mobile every 6 minutes
- Fact: 80 percent of users delete an app after first time use because of bad design, poor uability, slow loading time, crashes
- 60 percent delete an app that requires registration
- Half of them expect app to launch in under 2 seconds

Things to keep in mind

- ▶ Know about target customers
- ▶ Ask customers about needs
- ▶ Problem Solver
- ▶ Usability
- ▶ Reliable and robust
- ▶ Performance
- ▶ Appearance
- ▶ Above all: Keep it Fast, Simple and Usable

Mobile Networks

Mobile Networks

Technology / Features	1G	2G	2.5G	3G	4G
Start/ Deployment	1970/ 1984	1980/ 1991	1985/ 1999	1990/ 2002	2000/ 2006
Data Bandwidth	1.9 kbps	14.4 kbps	14.4 kbps	2 Mbps	200 Mbps
Standards	AMPS	TDMA, CDMA, GSM	GPRS, EDGE, 1xRTT	WCDMA, CDMA-2000	Single unified standard
Technology	Analog cellular technology	Digital cellular technology	Digital cellular technology	Broad bandwidth CDMA, IP technology	Unified IP and seamless combination of broadband, LAN/WAN/PAN and WLAN
Service	Mobile telephony (voice)	Digital voice, short messaging	Higher capacity, packetized data	Integrated high quality audio, video and data	Dynamic information access, wearable devices

Mobile Devices and the year 2007

- ▶ The smartphone revolution-started by Apple-January 2007
- ▶ "a revolutionary and magical product that is literally five years ahead of any other mobile phone" Steve Jobs
- ▶ HTC Dream(T-mobile G1)-Android by Google-November 2008r

The Big Two

- Market shares (February 2015)
  - Android 55.26%
  - iOS 23.82%
  - Windows Phone 2.32%
  - Blackberry 1.66%

Smartphone Components

- ▶ Mainboard or logic board
- ▶ CPU
- ▶ GPU
- ▶ Memory
- ▶ Antennas and Interfaces
    - ▶ Network Chips
    - ▶ WiFi
    - ▶ GPS
    - ▶ Infrared
    - ▶ Bluetooth

Smartphone Components

- Sensors
    - Light Sensors
    - Proximity Sensors
    - Acceleration Sensors
    - Gyroscope Sensors
    - Magnetic Sensors
    - Pressure Sensors
    - Temperature Sensors
    - Humidity Sensors

Smartphone Components

- ► Battery
- ► Vibration motor
- ► Memory card slot
- ► SIM card slot
- ► Touchscreen
- ► Hardware Buttons
- ► Speakers and microphones
- ► Charger/usb connector
- ► Front and rear cameras
- ► Flash

Types of Applications

- ▶ Native Applications
- ▶ Hybrid Applications
- ▶ Web Applications

Native Applications

- Applications built using the native language and tools supported by the platform
- Android: Java
- iOS: Objective-C

Pros

- ▶ Have full access to platform specific hardware and software features (multi touch, fast graphic APIs, built-in components: Camera, address book, geolocation)
- ▶ Good performance
- ▶ Good look and feel
- ▶ Easy distribution (available in app stores)
- ▶ Can store data offline

Cons

- ▶ More development with each supported platform
- ▶ Long approval process
- ▶ Updating/bug fixing processes are long
- ▶ App revenues to be shared

Examples

- Angry Birds
- Instagram

Hybrid Applications

- A hybrid app is a web app that translates to native code on a platform like iPhone or Android. A hybrid app uses a browser view and hooks to allow your web app to access features on your mobile device like Push Notifications, Contacts, or Offline Data Storage.
- App Development Tools:
  - PhoneGap
  - Ruby Motion:

Pros

- One code base for different mobile paltforms
- Frameworks offer access to hardware features
- Small updates can be performed on the server
- App distribution is easy
- Users can search for your app

Cons

- ▶ Bad performance when content is fetched from server
- ▶ Meeting platform design guidelines is difficult
- ▶ Platform specific features cannot be developed as they may not be available on other platforms
- ▶ Approval process may be long

Examples

- ▶ Facebook
- ▶ LinkedIn

Web Applications

- ▶ A web app is an app written in web code that is similar to a website but more interactive so it feels like an app on mobile devices.

Pros

- ▶ Popular technologies used for development
- ▶ Faster and cheaper to implement than the latter
- ▶ Mobile platform independent
- ▶ Easy access via web browser
- ▶ No app store submission required
- ▶ The updating process is fast and easy

Cons

- ▶ Limited access to hardware features
- ▶ Limited offline behavious
- ▶ Apps cannot be found in app stores

Examples

▶ Twitter

Business Models of Mobile Applications

- Freemium
- Paid
- Transaction

Freemium

- ▶ Free to download
- ▶ Generating revenues from freemium apps:
  - ▶ Limited free versions in terms of functionality, content or duration. Enhanced (paid) versions available
  - ▶ Advertisements
  - ▶ In-app purchase (commonly used in games for new levels and tools)
- ▶ Examples: Facebook, Instagram

Paid

- ▶ Pay before download
- ▶ Examples: Minecraft, monopoly, GTA

Transaction

- ▶ Payment made after completing a transaction with the app
- ▶ Example: Google Wallet

App Stores

- Google Play
- App Store
- Amazon
- China Mobile
- Mozilla
- Samsung
- T-Mobile
- Vodafone

App Stores

- ▶ Pre installed app stores
- ▶ Generates revenue
- ▶ 30% revenue goes to platform provider
- ▶ Note: keep in mind stores review and publishing policies

App Stores

App Stores

Challenges in Mobile App Testing

- Device diversity
- Mobile platform/OS variation
- Industry standards
- Network Operators

The Customer

- ► Gender
- ► Age
- ► Monthly income
- ► Educational background
- ► Geographical background
- ► Kinds of apps they use
- ► Smartphone habits
- ► Devices in use

The Customer

- ▶ Gather user information
- ▶ Create personas
- ▶ Use personas while testing
- ▶ Invite customers to usability tests
- ▶ Interview customers about your product
- ▶ Invite customers for beta testing
- ▶ Check app store reviews and comments for feedback

The Customer

The Customer

THE CASUAL USER

Pete

Uses most phone features

Uses phone to make, use contacts send texts and take pictures

Always has mobile device with him

THE BUSINESS USER

Jennifer

Whats a simple phone, but functions as an integrated device

Wants to easily read email and call back the sender

Needs "Popular" mail sever integration

THE POWER USER

Brad

Will use almost all built-in mobile functionality

Will exend phone functionality with additional software

Will look through and change change every menu option

Mobile Device Fragmentation

- ▶ Fragmentation: inability to write once and run everywhere
- ▶ Use of several different versions of the same operating system during the same period of time
- ▶ 1. Mobile device groups
- ▶ 2. Mobile device labs

Mobile Device Groups

- ▶ Create device groups based on target customers
- ▶ Group 1: High priority
    - ▶ High end devices
    - ▶ Dual/quad core CPU
    - ▶ RAM $\geq$ 2.048 MB
    - ▶ Display size $\geq$ 5
    - ▶ Retina, full HD display
    - ▶ Latest operating system

Mobile Device Groups

- Group 2: Medium priority
  - Midrange devices
  - Dual-core CPU
  - RAM $<$ 2.048 MB
  - Display size $<$ 5
  - No retina or full HD display
  - Software less than a year old
- Group 3: Low priority
  - Slow devices
  - Single-core CPU
  - RAM $<$ 1.024 MB
  - Display size $<$ 4
  - Low screen resolution
  - Older operating system

Mobile Device Labs

- Cloud based mobile application testing
- Benefits
    - Large number of devices available for testing
    - Test execution can be performed on several devices in parallel
    - Without a phone plan, one can test incoming, outgoing call services and messaging
    - Variety of plans available such as hourly, monthly or yearly subscriptions
    - Automation can be recorded and can be played as videos
    - Users can use the tool from anywhere, anytime

Sensors

- Ambient light sensor
- Proximity sensor
- Acceleration sensor
- Gyroscope sensor
- Magnetic Sensor
- Pressure, temperature and humidity sensors
- Location sensor
- Touchless sensor

Ambient Sensor

- ▶ Determines the intensity of light and adjusts screen brightness
- ▶ Usage: adjust lights while reading
- ▶ Testing methods: change locations(dark room, in sunshine, different kinds of lights)

Proximity Sensor

- Used to determine how far an object is from the device
- Avoids accidental touch events
- Usage: used during answering calls
- Testing methods: change locations, lights, surfaces

Acceleration Sensor

- Detects changes in the device movement. Measure linear acceleration
- Usage: rotation between portrait and landscape modes
- Testing methods: Frequent changes in orientation

Gyroscope Sensor

- ▶ Enables device to detect 360 degree motion. Uses earth's gravity to determine orientation.
- ▶ Usage: angular rotation, airplane navigation
- ▶ Testing methods: test for different orientations and axis

Magnetic Sensor

- Measures strength and orientation of magnetic field around device
- Usage: compass information, navigation
- Testing methods:
    - Inside a building
    - On the streets surrounded by buildings
    - Near metal devices/buildings

Pressure, Temperature and Humidity Sensors

- ▶ Not available in all smartphones
- ▶ Usage: weather apps
- ▶ Testing methods:
  - ▶ Simulate pressure or humidity in lab
  - ▶ Test in natural conditions

Location Sensor

- ► GPS - Global Positioning System
- ► Usage: maps, camera apps, social media apps
- ► Testing methods:
    - ► Countryside
    - ► Downtown

Touchless Sensor

- ▶ Not available in every smartphone
- ▶ Accepts gestures from hand or facial expressions
- ▶ Usage: swipe by waving, automatic call answering
- ▶ Testing methods:
  - ▶ Test for gestures at different angles

Interfaces

- ▶ Touchscreen
- ▶ Microphone
- ▶ Camera

Summary

- ▶ Components available for mobile application development
- ▶ Strategies to make test cases for mobile application testing

References I

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Appendix
References

📔 Daniel Knott
Hands-On Mobile App Testing.