Becoming a Pro (II)

IN Mobile Applications Testing

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Overview: *Mobile APPS*

- Categories
- Types
- Distribution/Installation/Logs
- Mobile Test Industry Standards
- Remote Device Access (RDA)
- Emulators
- Simulators
- Troubleshooting Guide
- App Risk Analysis

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REMOTE DEVICE ACCESS (RDA)

Manual application and website testing run on the company`s devices

Website testing on multiple devices with URL input

Fast screenshot export

PC keyboard text input

Application testing supported with outgoing and incoming text messages

Calls and messages exchange among several virtual devices

Scalable picture from device to PC

Control over audio/video quality (important for slow Internet connection)

Full control over the device operation process (physical and virtual keypad, touch and slide functions, g-sensor, device restart, battery disconnection)

Operation of an unlimited number of devices simultaneously (with an hourly fee)

Test case manager, business paper organizer

Automation script creation and processing upon several devices (enterprise package)

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REMOTE DEVICE ACCESS (RDA) Summary

Provides testing access to a huge variety of mobile devices.

The specialty of the service is that they actually make use of remote connection to real devices

it's the real thing you are testing against, and not just an emulator.

DA Service can be used for testing of mobile websites as well as HTML5 hybrid apps and native apps.

Works on: Windows, Linux, Mac OS X

Brief Comparison between DeviceAnywhere (DA) and PerfectoMobile(PM)

DA - has wider scope of devices covering multiple countries- covering US/UK/France/Europe etc.. and supports corresponding carriers when compared to PM.

DA has wide range of handsets when compared to PM.

Camera quality is really good in DA when compared to PM(for taking screenshots, capturing videos)

PM has advantage with regards to automation over DA.

PM is cheaper when compared to DA

PM supports Indian carriers where as DA does not.

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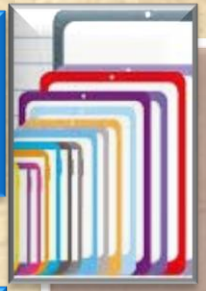
EMULATORS : MOBILE

- Generally provided by Device Manufacturers and simulate the actual device.
- An Emulator has the goal of taking the place of the real (in our case) mobile device.
- Emulator duplicates every aspect of the original device's behaviour, both hardware and software.
- Basically simulates all of the hardware the real device uses, allowing the exact same app to run on it unmodified, and all of the software.



DEVICE EMULATORS

Excellent for testing your site or application on a particular device or set of devices.

BROWSER EMULATORS

These simulate mobile browser environments. Whilst useful for determining the functionality available in a particular mobile browser, they are useless for device-specific testing.

Operating System Emulators

Microsoft provides emulators for Windows Mobile, and Google provides an emulator for Android. These run within a simulated mobile device environment and provide access to applications running within the operating system, e.g. a Web browser.

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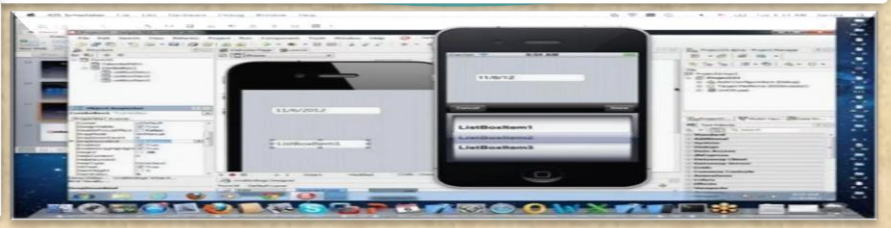
EMULATORS : MOST POPULAR

There are a large number of emulators available.
The following companies offer emulators for some or all of their mobile devices :



- Research in Motion (BlackBerry)
- Apple (iPhone)
- Samsung
- Palm
- LG
- Motorola

Browser Emulators

- Opera Mini
- Openwave

Operating system emulators are available from:

- Microsoft (Windows Mobile)
- Google (Android)
- Nokia (Series 40 and Series 60)

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EMULATORS :Android

Android Emulator comes as part of the android SDK commonly known as AVD – Android Virtual Device. It lets the user to prototype, develop, and test Android applications without using a physical device.

Android Emulators

The AVD's are OS version specific and provides the user the flexibility to customize OS version, resolution,skin, sd card size and various other hardware properties to be emulated.

There are many command line utilities and tools which comes as part of the sdk which makes it easy to debug and interact with emulator

Prerequisites for Android Emulator

- JRE – Java Runtime Environment
- Android SDK

Installing an application on Android Emulator

- If the application is available in Google Playstore it can be directly downloaded and installed on to the device.
- If the application is available in '.apk' format ,it can be installed using the command, 'adb install ' .

Adb is a command line utility which comes as part of the SDK.

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EMULATORS : iPhone

A note about terminology:

The terms '***Mobile Emulator***' and '***Simulator***' are sometimes used interchangeably.

It doesn't help that *Apple* considers its native emulator a 'simulator' whereas *Android* tools are called emulators.

In the case of *Apple*, you need ***Xcode***

- *Apple always harps on the importance of device testing because iPhone Simulator does not emulate an iPhone processor, disk drive, memory constraints and whatnot.*
- *You hardly ever get memory warnings unless your Mac is struggling to manage resources itself, unless you simulate (again) memory warnings from the Simulator's menu item.*

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EMULATORS : Blackberry

BlackBerry Simulators is different from the other emulators as this is Device model specific (rather than OS version) • Easy to use interface for installing and testing apps

Blackberry Emulators

• Model specific blackberry emulators are available from RIM as standalone window applications and also along with BB JDK.

• The BlackBerry MDS Simulator and the BlackBerry Email Simulator simulates internet and email services respectively.

Prerequisites for Blackberry Simulator

• JRE – Java Runtime Environment

• Blackberry simulator package • Blackberry email and MDS Simulator

Installing an application on Blackberry emulator

• If the application is in .cod format, it can be directly loaded in to the emulator from the menu options in emulator.

• If the simulator is being used with an IDE or Blackberry JDE it directly loads the application into the simulator and runs it.

• The blackberry device manager can also be used to for installing the applications on emulator and device

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EMULATORS : Windows Phone

Windows Phone 7 is a mobile operating system developed by Microsoft, and is the successor to its Windows Mobile platform.

The Windows Phone 7 emulator comes with SDK and Windows Developer Tool Kit.

Pre-requisites for the emulator

- Windows Vista and higher Desktop OS
- Microsoft Silverlight along with silver light toolkit for windows phone
- Visual Studio 2010
- Windows mobile 7 sdk

Installing applications in emulator

- Open the "Application Deployment" tool which is the part of "Windows Phone Developers Tool"
- Provide the path to the .xap file of the application in the tool
- The emulator opens showing the application that has been installed

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EMULATORS Pros and Cons

1. Freeware and easily downloadable for use

2. It is possible real time scenarios like out of network, Emergency calls etc

3. Since emulator integrates with the development IDE, it would be easy to debug the application for a developer.

1. The Real live interactions cannot be performed(Ex. scanning , capturing etc)

- It is not possible to test the applications on a live network connectivity.

2. It just mimics the mobile device from various platforms and hence testing on the emulator cannot guarantee the stability of the application.

3. Some of the interruption test scenarios may also not work properly as like in real handset to predict the actual behavior of the application.

4. Memory Leak issues and Performance issues cannot be detected.

5. Dependency on platform to launch the simulator (Ex. MAC Desktop)

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EMULATORS vs Real Devices

USER EXPERIENCE AND USABILITY

- User Interactions
- Real occurring events
- Overall performance
- Consistency in results

SPECTRUM OF DEVICE CONFIGURATIONS (HARDWARE)

- Chipset
- Display
- Memory
- Sensors

PLATFORM + CUSTOMIZATIONS (SOFTWARE)

- Platform/OS version
- OEM and Carrier customizations
- *Dependencies to other software/app*

INFRASTRUCTURE (NETWORK)

- Network/WiFi

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EMULATORS vs Real Devices Summary

Testing types	Device	Emulator
Unit Testing		
Sanity &Acceptance		
Functionality Testing		
Interruption		
Regression		
Localization		
Compatibility		
Negative		
User Acceptance Testing		
Performance and security		

Legend: Support - No; Support - Yes; Support - Partial

EMULATOR

When there is a necessity to observe the behaviors of the software product under various adverse conditions such as memory shortage of the device;

In the process of finding obvious issues on several platforms, performing functional testing.

You need to test your app on as many devices as possible to ensure the maximal coverage either geographically or globally.

REAL DEVICE

One of the main tasks of the mobile applications testing is usability testing, which is impossible without having the real device at hand;

Real mobile devices mean real user environment. Some definite actions like scrolling and zooming are to a great extent different on the touchscreen;

Only actual mobile device has the platform that is suitable for testing experiences of the end-users;

Usage of real devices is much needed in the process of testing the hardware characteristics, such as quality of the display. Besides, the best way of testing memory consumption is testing it on the whole range of actual devices;

It is impossible to monitor possible network issues with the help of an emulator. In this case you will definitely need an actual mobile device

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EMULATORS : Mobile Automation- Desktop Based

Mobile test automation tools are installed on a desktop locally
Interacts with the mobile devices through USB connection or Wi-Fi
Mobile Apps can be installed & tested on both Emulators as well as real devices

A Typical set up for Mobile Test Automation

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Simulators : MOBILE

- Mobile Simulator is a software application for a personal computer which creates a virtual machine version of a mobile device,such as a mobile phone, iPhone, other smartphone, or calculator, on the computer.
- The mobile simulator allows the user to use features and run applications on the virtual mobile on their computer as though it was the actual mobile device.
- A mobile simulator lets you test a website and determine how well it performs on various types of mobile devices.
- A good simulator tests mobile content quickly on multiple browsers and emulates several device profiles simultaneously.
- This allows analysis of mobile content in real-time, locate errors in code, view rendering in an environment that simulates the mobile browser, and optimize the site for performance.
- Mobile simulators may be developed using programming languages such as Java and .NET

A **SIMULATOR** sets up a similar environment to the original device's OS, but doesn't attempt to simulate the real device's hardware.

Some programs may run a little differently, and it may require other changes (like that the program be compiled for the computer's CPU instead of the device's), but it's a close enough match that you can do most of your development against the simulator.

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Simulators Pros and Cons

1. Study the behavior of a system without building it.
2. Results are accurate in general, compared to analytical model.
3. Help to find un-expected phenomenon, behavior of the system.
4. Easy to perform ``What-If'' analysis.

1. No support for placing or receiving actual phone calls.

   You can simulate phone calls through the emulator console, however.
2. No support for USB connections
3. No support for camera/video capture (input).
4. No support for determining connected state
5. No support for Bluetooth
6. No support for actual GPS
7. No support for Accelerometer feature used in Gaming applications

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SIMULATORS vs EMULATOR

Functionality	Emulator	Simulator
What it mimics ?	Mobile device software Mobile device hardware Mobile operating system	Internal behavior of the device. It does not mimic hardware.
How to get it ?	It is generally provided by the device manufacturer.	It is generally provided by the device manufacturer or some other company.
Internal structure	It is written in machine-level assembly language.	It is written in high-level language.
Debugging	It is more suitable for debugging.	It is not suitable for debugging purpose.
Performance	Emulators are really slow. Emulating the actual hardware usually makes the software run slower than it would natively.	Faster than emulators.
Example	Google's Android SDK	Apple's iOS Simulator

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SIMULATORS vs EMULATOR vs Real Device SUMMARY

Functionality	Real Device	Emulator / Simulator
Price	Getting real devices will cost you a lot.	It is almost free, we just need to download and install them
Processing Speed	It has faster processing; however network latency may be normal.	It is slower as compared to actual devices. It has observed less latency than real devices connected to the local network or in the cloud.
Debugging	Debugging is not that easy.	It provides step-by-step debugging of an application. Also, it provides an efficient way for capturing screenshots.
Web-app Testing	Web applications can be tested in a normal way.	Testing a web application is much easier.
Reliability	Testing on a real device has a major advantage that it always gives accurate results.	It cannot simulate all types of user interactions; hence it may lead to false results sometimes. So it scores low when it comes to reliability.

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SIMULATORS vs EMULATOR vs Real Device

SUMMARY EXTRA "ADVANTAGES"

Issue	Emulator /Simulator Testing	Real Device Testing
Situation-based application	There are specific situations where the deadline to produce text execution results are short and purchasing the required mobile devices may be not possible.	The real device allows the testers to test almost all the real time scenarios which can be tested for the mobile applications. These devices are operated using fingers and simulate real-life usage.
Feeling of closeness towards the real handheld devices	The wide gamut of mobile devices creates the problems, whereby the testers are not confident about which mobile devices to invest in.	The real device allows the testers to test even usability
Ease of availability	Emulator/simulator(s) are in most cases open and free software	The real devices allow stringent performance testing issues like working with a real time transport application for 15 hours continuously which cannot be successfully simulated by the emulators.
Ease of opening an Web application through URL	It is easier to do web application testing when it comes to opening the web application. The user just needs to copy and paste the application URL.	Testing on real devices provides more in terms of reliability.

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SIMULATORS vs EMULATOR vs Real Device

SUMMARY EXTRA "ADVANTAGES"

Issue	Emulator Testing	Real Device Testing
Capturing screenshots of the situations where defects appear	Capturing issue of screenshots over simulator is very easy with the simulator since we just need to use Microsoft office facilities.	Testing with real world devices is very helpful in terms of interoperability testing.
Simulation of validation of battery scenarios	The emulator/simulators are not able to simulate the battery issues.	Real world devices can easily perform the same.
Validation of incoming interrupts	The emulator/simulators are not able to simulate the incoming interrupts for SMS as well as the incoming calls.	Real world devices can easily simulates incoming interrupts.
Validation of exact color displays	The emulator/simulator is not able to properly emulate/simulate the exact color display of the devices when the real device is in sunlight or in black.	Real world devices can easily simulates the exact color displays.
Validation of the performance	The performance of the emulator/simulator tends to be slower than the original devices at times.	The original devices tend to perform faster than the emulator or the simulators.
Simulating memory related issues	The memory available at the emulator/simulator tends to be far more than in the real devices	The memory storage level of the devices tend to be far less than the emulators thus it may

SIMULATORS vs EMULATOR vs Real Device

SUMMARY EXTRA "DISADVANTAGES"

Emulator/Simulator Testing	Real Device Testing
The emulator/simulator is not always the best type of solution for scenarios such as the ones whereby the testing team needs to validate the performance of the application for a longer period of time.	The real devices are costly compared to the emulator/simulators. Thereby projects under budget and timeline constraints may risk profitability as well as the viability of the overall project.
The emulator/simulator is suitable mostly for certain types of functional test case executions.	There is a very wide variety of mobile devices from apple to Samsung to android and to Symbian and so on.
The emulator/simulator can some time not be supportive of certain types of application	Real Mobile devices when used in the developing stage for unit testing and similar purposes could turn out to be harder to connect to the IDE than the emulators
Not all the emulator/simulator supports the complete gamut of mobile applications.	In order to test with the real world devices, the devices need to be always connected to the USB port of the machines.

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Simulators : iPhone

iPhone and iPad are popular devices from Apple. Its has its own proprietary operating system, iOS. Its well known for its design and performance.

Prerequisites:

MAC Environment

Getting Started:

- **Deploy Native app into iPhone Simulator using Xcode.**

- **Xcode - an integrated development environment that manages your application projects and lets to edit, compile, run, and debug code**

- **Once the native app is deployed, the app icon appears on simulator, thus aids to access the app directly from simulator**

- **Testing in UIAutomation can be done by both developer and tester, it requires knowledge of iPhone development.**

- **UIAutomation is the automation technique for iPhone.**

It uses JavaScript as test script to perform automation. This can be done both in device and simulator

- **iPhone Simulator does not emulate an iPhone processor, disk drive, memory constraints**

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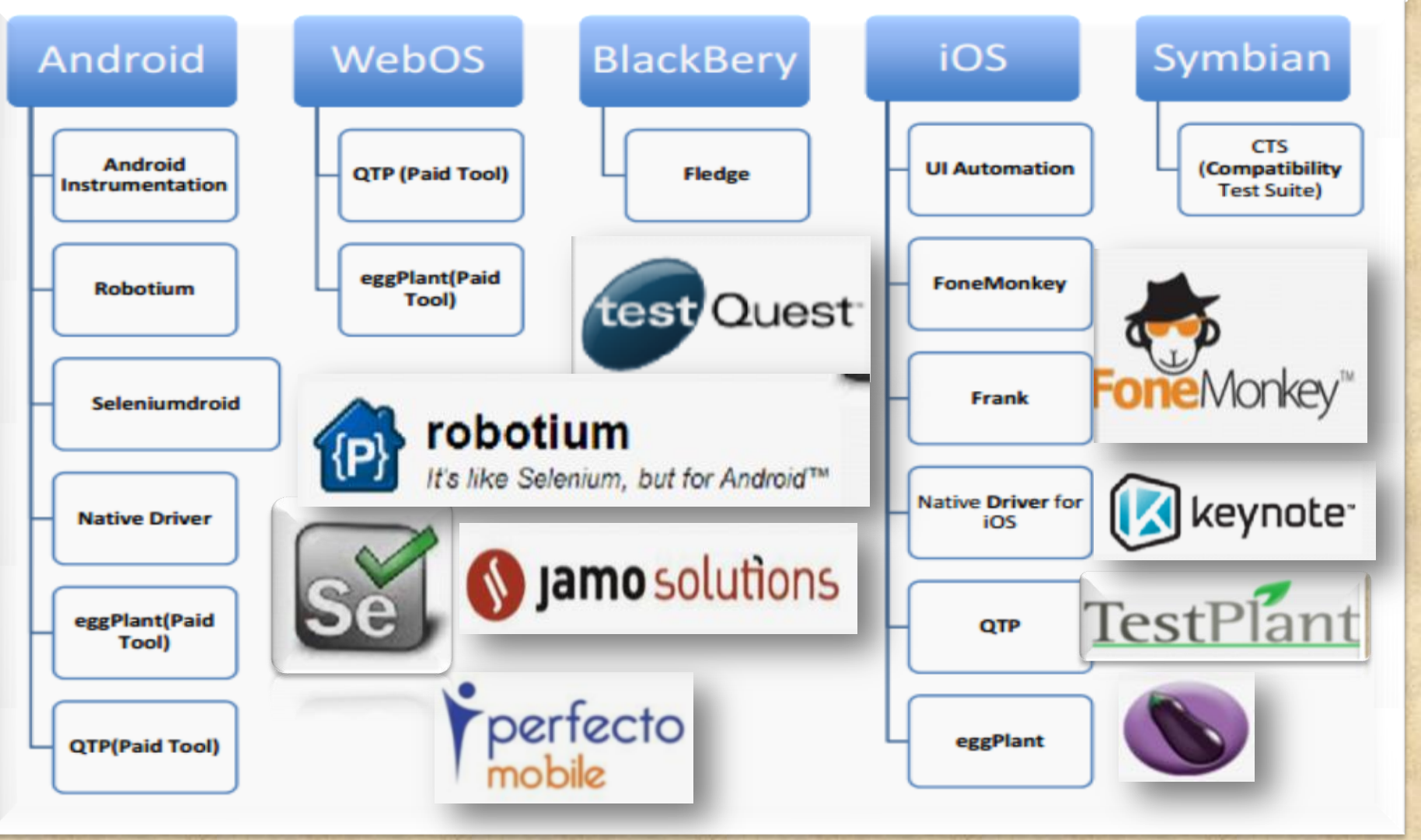
Most Popular Mobile App Testing Tools

Existing Mobile Platforms And Available Test Automation Tools



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EXTRA<WHAT'S NEW ?>EXTRA

Mobile Applications Testing

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Overview

iOS

Android

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ANDROID

RELEASE HISTORY and Current Versions (as of Dec 7th,2016)

Android Nougat

7.0 -7.1 For selected devices

Marshmallow
6.0-6.0.1
All devices

Lollipop 5.x

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ANDROID

RELEASE HISTORY

Code name	Version number	Initial release date	API level	Support status
Alpha	1.0	September 23, 2008	1	Discontinued
Beta	1.1	February 9, 2009	2	Discontinued
Cupcake	1.5	April 27, 2009	3	Discontinued
Donut	1.6	September 15, 2009	4	Discontinued
Eclair	2.0 – 2.1	October 26, 2009	5–7	Discontinued
Froyo	2.2 – 2.2.3	May 20, 2010	8	Discontinued
Gingerbread	2.3 – 2.3.7	December 6, 2010	9–10	Discontinued
Honeycomb	3.0 – 3.2.6	February 22, 2011	11–13	Discontinued
Ice Cream Sandwich	4.0 – 4.0.4	October 18, 2011	14–15	Discontinued
Jelly Bean	4.1 – 4.3.1	July 9, 2012	16–18	Discontinued
KitKat	4.4 – 4.4.4	October 31, 2013	19	Discontinued
Lollipop	5.0 – 5.1.1	November 12, 2014	21–22	Supported
Marshmallow	6.0 – 6.0.1	October 5, 2015	23	Supported
Nougat	**7.0 – 7.1.1**	**August 22, 2016**	**24–25**	Supported

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ANDROID

Android 6.0 vs Android 5.1 Lollipop: What's New in Marshmallow ?

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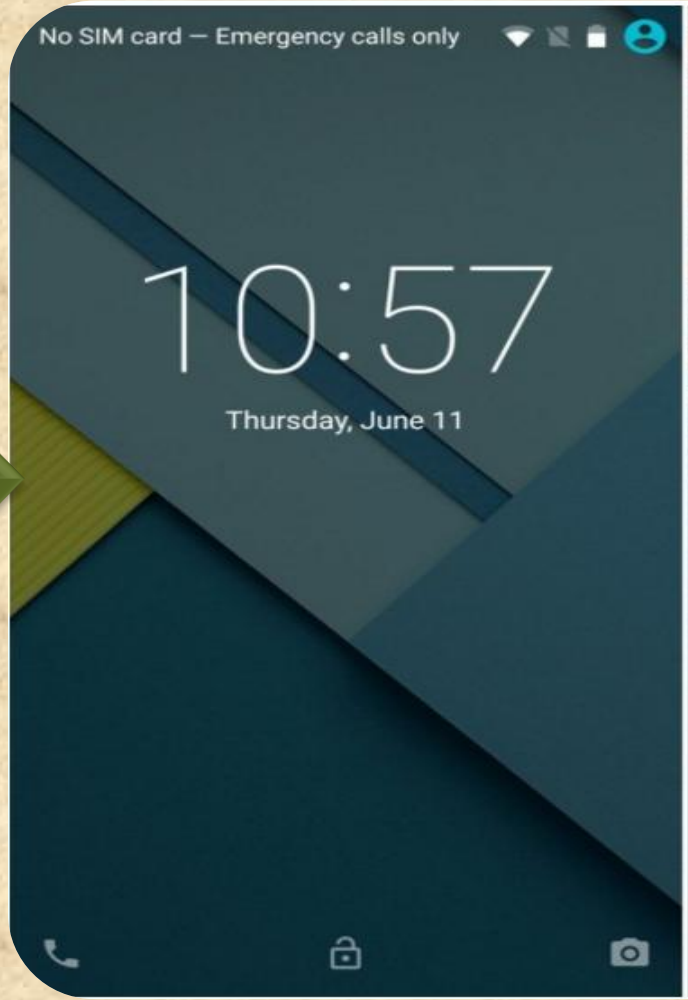
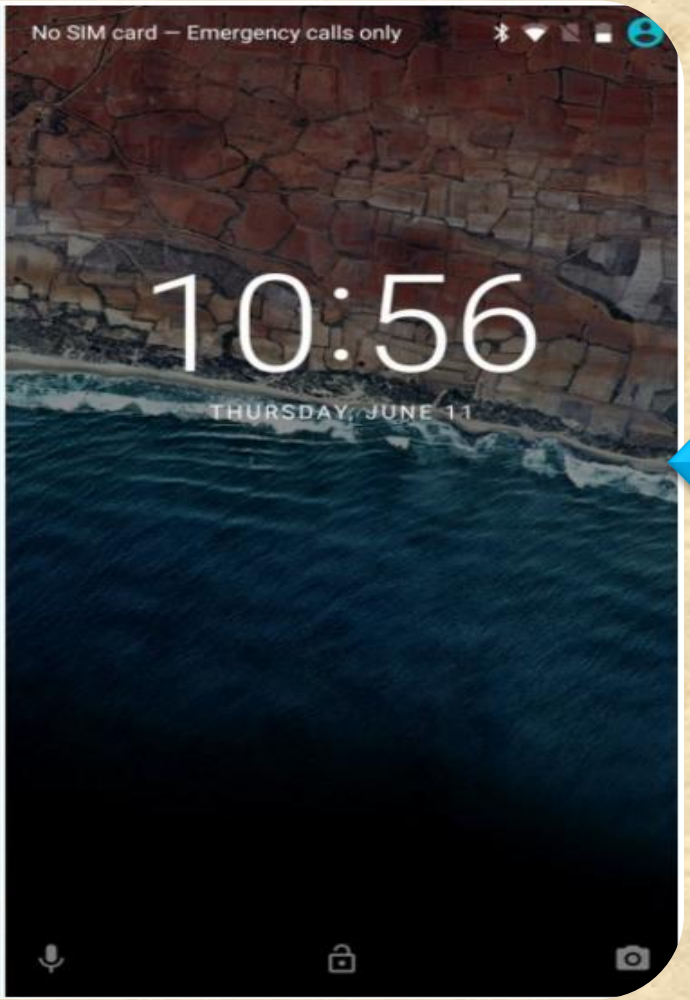
ANDROID

LOCKSCREEN

5.1





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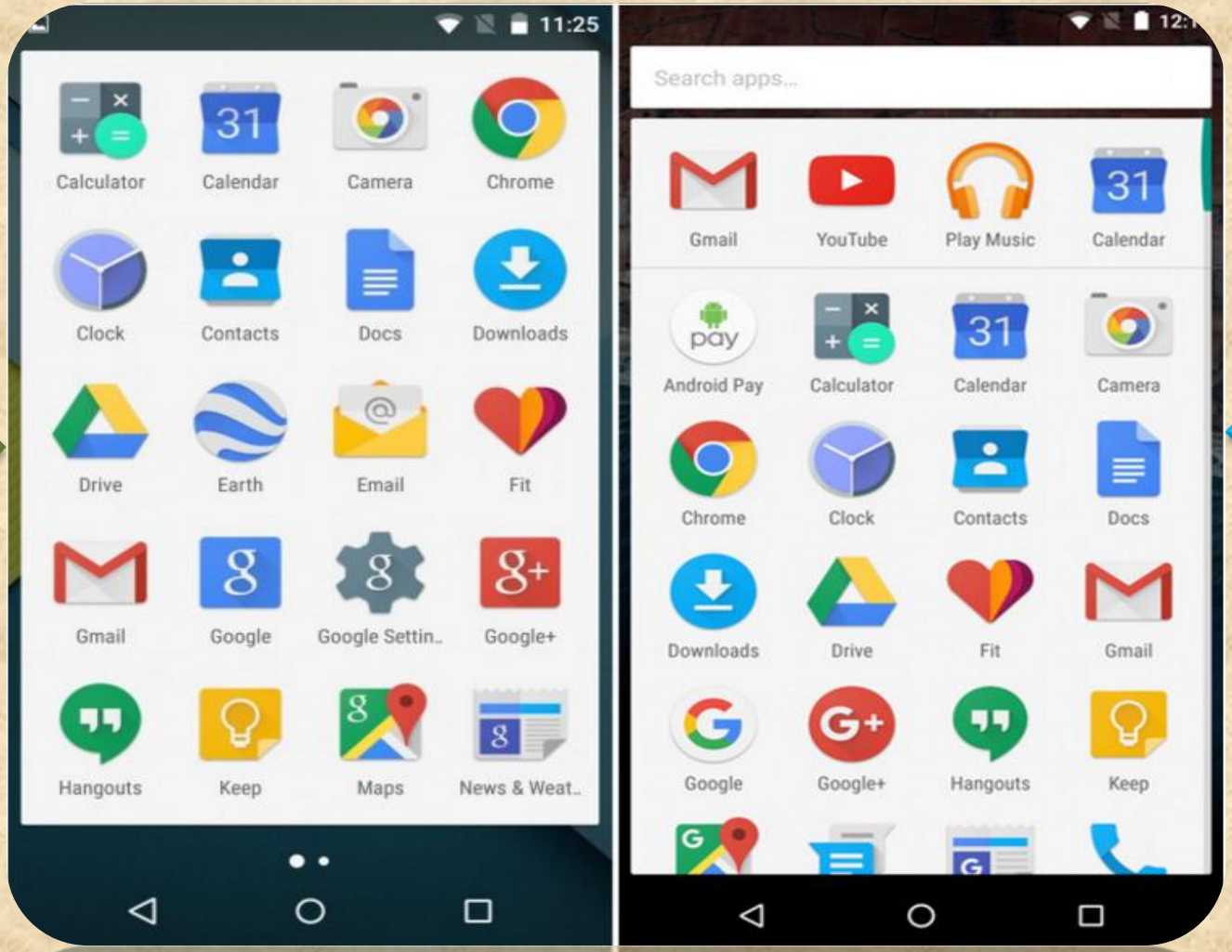
ANDROID

APP TRAY

5.1



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ANDROID

Notification Bar Settings

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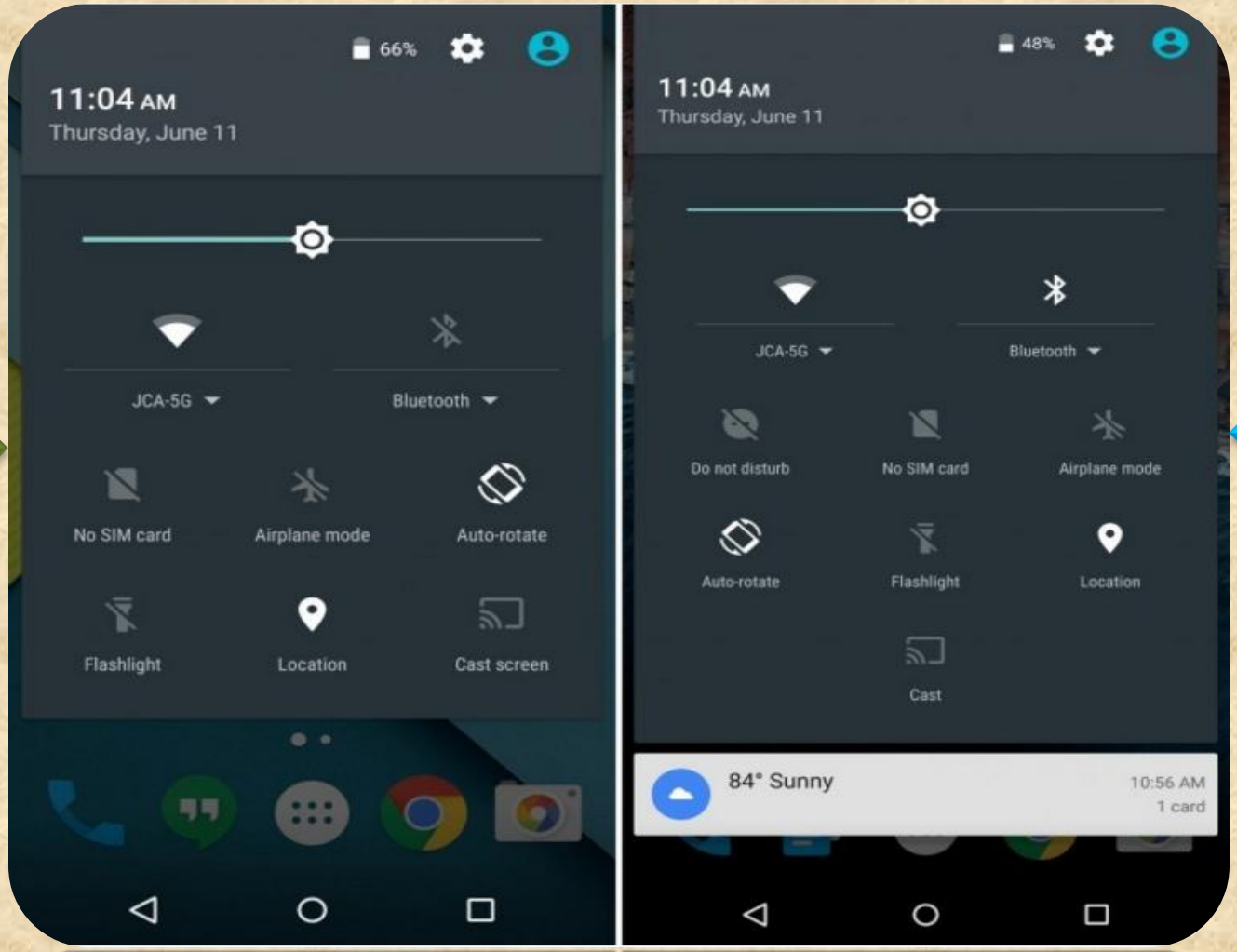

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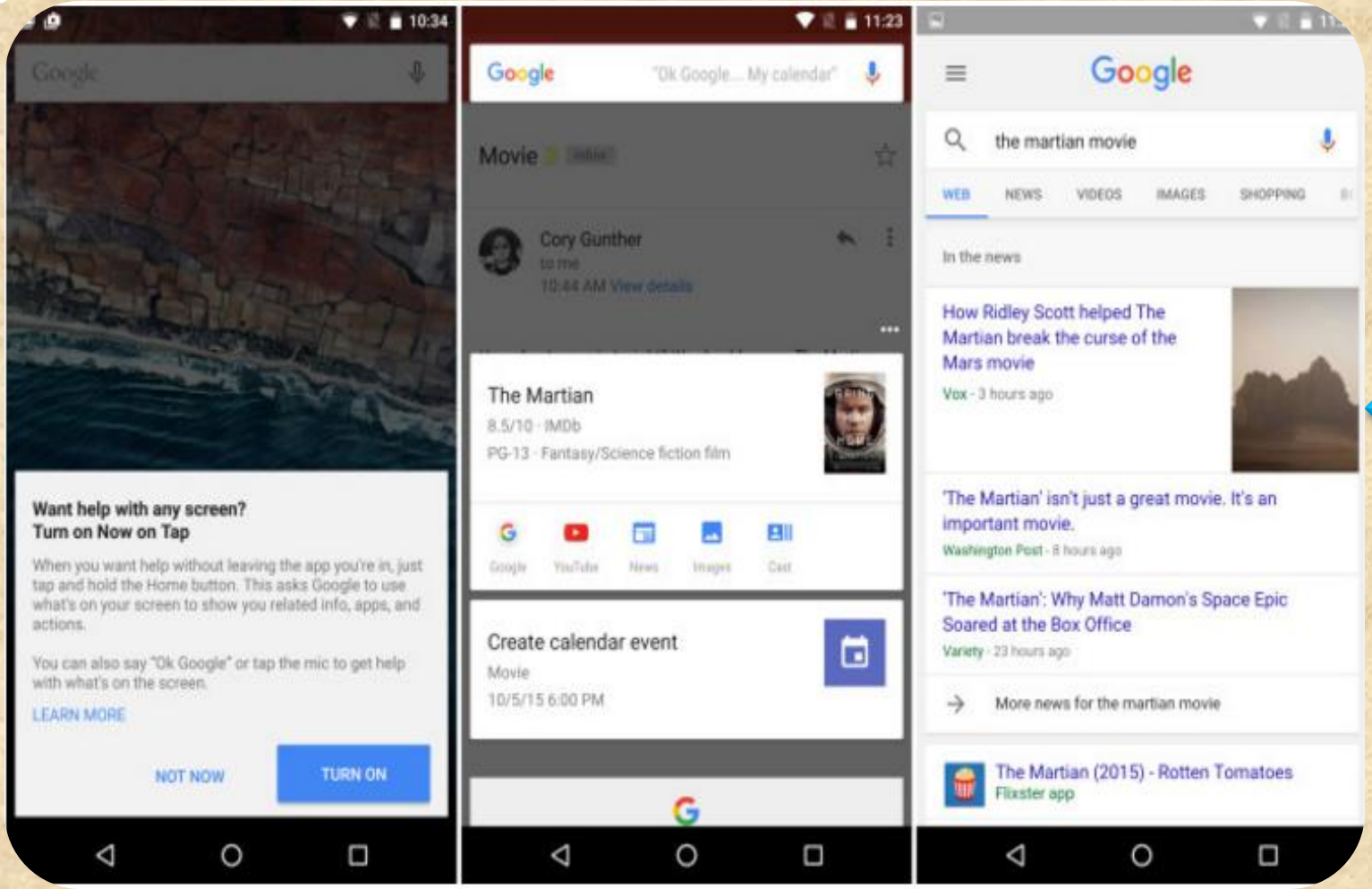
Google Now on Tap (N/A for 5.1)



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