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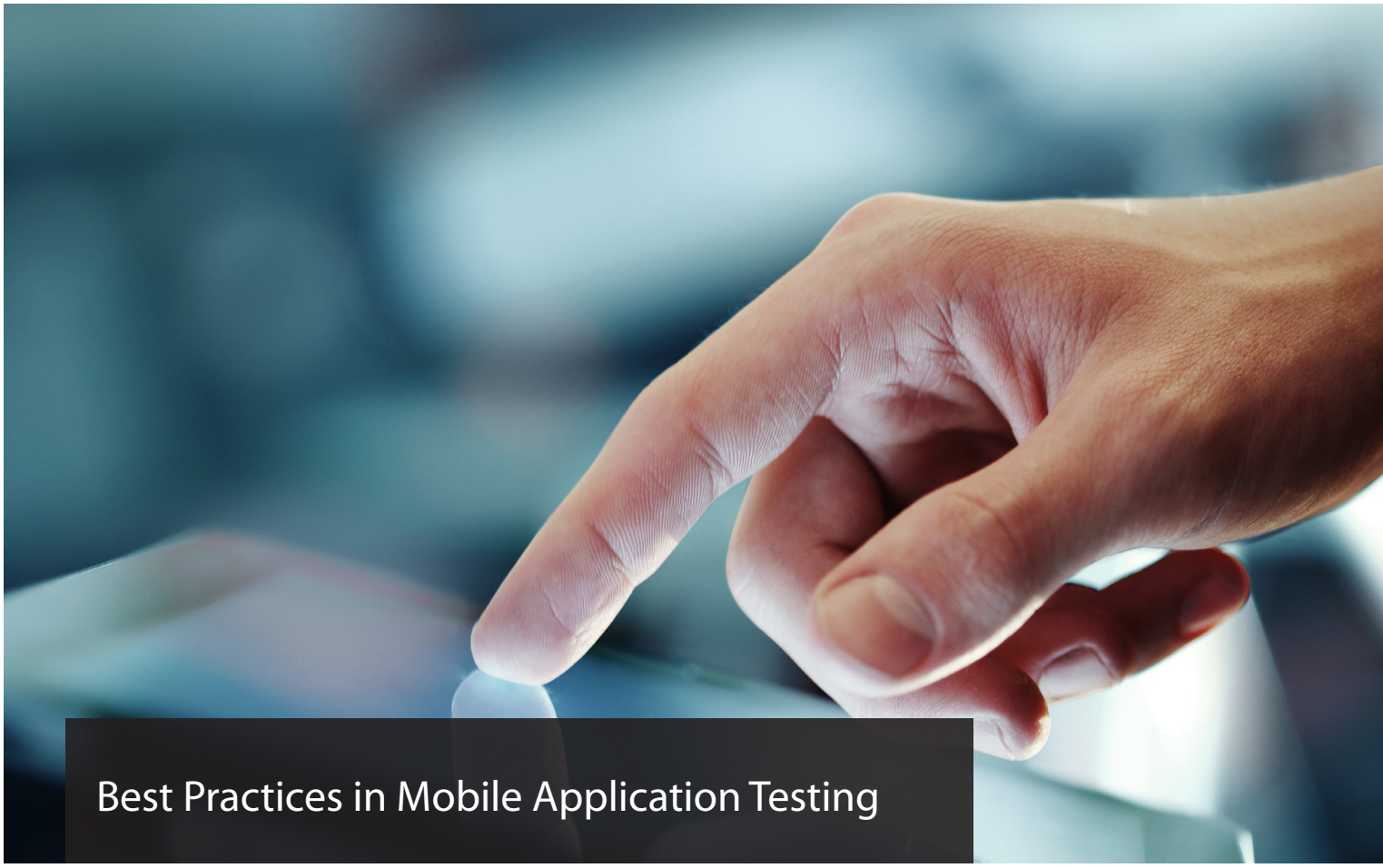
White Paper



Best Practices in Mobile Application Testing

- Mohan Kumar, Manish Chauhan

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Introduction

In many ways, mobile testing is more challenging than testing based on desktop or Web applications. Mobile applications have a smaller footprint on the virtual machine as opposed to a desktop application.

Today Android and IOS are the most successful mobile platforms. Most companies are preparing enterprise applications for various mobile handset manufacturers with various flavors of the operating system on different screen sizes and hardware configuration like keypad, trackballs, etc.

It is enormously challenging to verify enterprise applications across myriads of handsets with different screen sizes and operating system flavors. Therefore, testing teams need to find better and more cost-effective solutions to avoid any compromise on quality.

This white paper describes QA challenges in mobile application testing and discusses mobile testing strategies, mobile testing types and mobile testing automation tools.

In today's business environment, many vendors are operating in the enterprise mobility market to ensure that any given application is isolated, secure and performs well. This allows users and administrators to focus on preventing virus attacks, security issues, device theft, and managing personal data and administration work.

QA Challenges in Mobile Application Testing

he goal of any application testing exercise is to understand the quality and performance of the features offered. There are, however, some critical factors which make mobile testing a far greater challenge vis-à-vis desktop and web-based application testing. These factors are:

Device Variation

Mobile application testing is difficult due to compatibility issues as a mobile application can be deployed across devices which have different:

- Operating systems like iOS, Android, Windows, BB, etc.
- Versions of an operating system such as iOS 4.x, iOS 5.x, BB4.x, 5.x, 6.x, etc.
- Manufacturers like Samsung, HTC, Nokia, Micromax, etc.
- Keypad type such as virtual keypad, hard keypad, etc.

Further, the quality team cannot guarantee that if a tested application works well on a given device, it will work 100% on another device even if it is from the same product family because the screen resolution, CPU, Memory, OS optimization, and hardware could be different.

Mobile Testing Tool Availability

The tools used for desktop and web-based applications do not work for mobile application. Hence, a complex scripting technique and new tool development is required for mobile application testing.

Industry Standards

Mobile application testing must meet industry standards for an application to be globally acceptable and popular.

Need for Skilled QA specialist in Automation Testing

The quality team needs a skilled QA specialist not only to assess the automation tools available in the market for testing but also to quickly identify user interface bugs as UI is critical in mobility. A well-tested and fully functional mobile application could be rejected by end users merely due to UI look and feel.

Cloud Computing

Cloud computing offers a web-based mobile environment on simulators where testers can deploy, automate and test the mobile application. This approach helps reduce the cost of the project under development.

Following are the most common problems faced by testers in cloud environment.

- Subscription model
- High cost
- Lock-in
- Internet connectivity issues
- Automation is image-based and time consuming
- Automation cannot be used outside the framework

Mobile Application Testing Strategy

In mobile application testing actually there are too many tools and techniques available to meet quality requirement so we can focus on following factors depicted in figure 2 to minimize the testing requirement.

Emulators	Cloud Testing Solution	Physical Device
• All applications can be deployed and tested on emulator without investing in Mobile Handset for various OS. • Emulators are mostly available free, and we can also perform UI, Stress and performance testing on that. • 30-40% test	• The Mobile devices can be accessed through web interface i.e. Browser. • Application can be deployed, tested and managed. • Automation module is available and solution is secure if private cloud is used with no maintenance	• Upto 100% test coverage can be achieved. • Real device testing will give the most realistic view of test results. • All possible types of testing activities can be performed including that are dependent on hardware.

Fig (2) Mobile Application Testing platforms

Device Emulator

QA team can perform most of the testing in a well-equipped test environment using device emulators with various options like ability to bypass the network, using live environment via modems and use of an effective scripting language. This is a cost effective solution

Mobile Cloud Computing Solutions (Remote Real Devices)

The QA team can use the mobile cloud computing environment to deploy and test an application. In the cloud approach, the task and data are kept on the Internet rather than on an individual device, providing on-demand access. By reducing the complexity of the implementation, companies that take advantage of cloud services can significantly reduce project costs and boost the return on investment of a mobile computing solution.

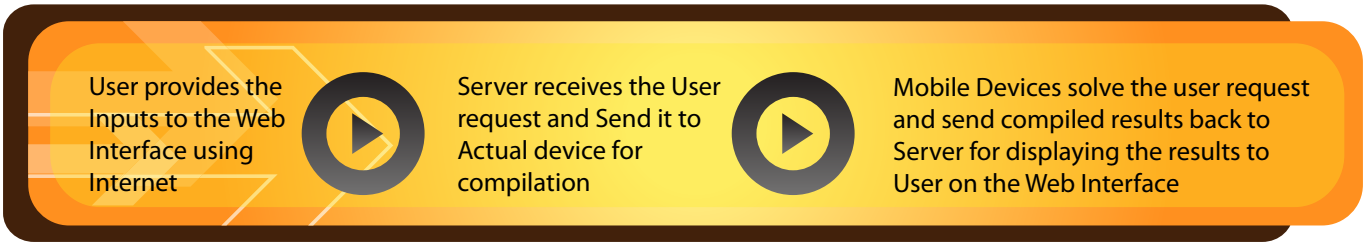

Fig (3)-Cloud computing diagram

There are several benefits of using a cloud solution:

- Rent per hour, swap devices
- Test incoming calls and text without needing a cell plan
- Automated test execution is recorded to video to investigate failures
- Device logs are recorded to help with troubleshooting
- Large number of devices available for testing
- Tests can be run on several devices in parallel
- Web-based interface
- Build integration

Real Time Devices with Real Networks

The QA team cannot completely avoid this option but there should be an option to test real devices on real networks whenever required. This is important since the Mobile application will always be used on mobile devices by end users who may access the application from a remote area with fluctuating network signal strength.

Automation Tools to Avoid Manual Work

The QA team should automate the mobile applications task to avoid manual work for time and cost savings. There are several automation tools available in the market for mobile applications.

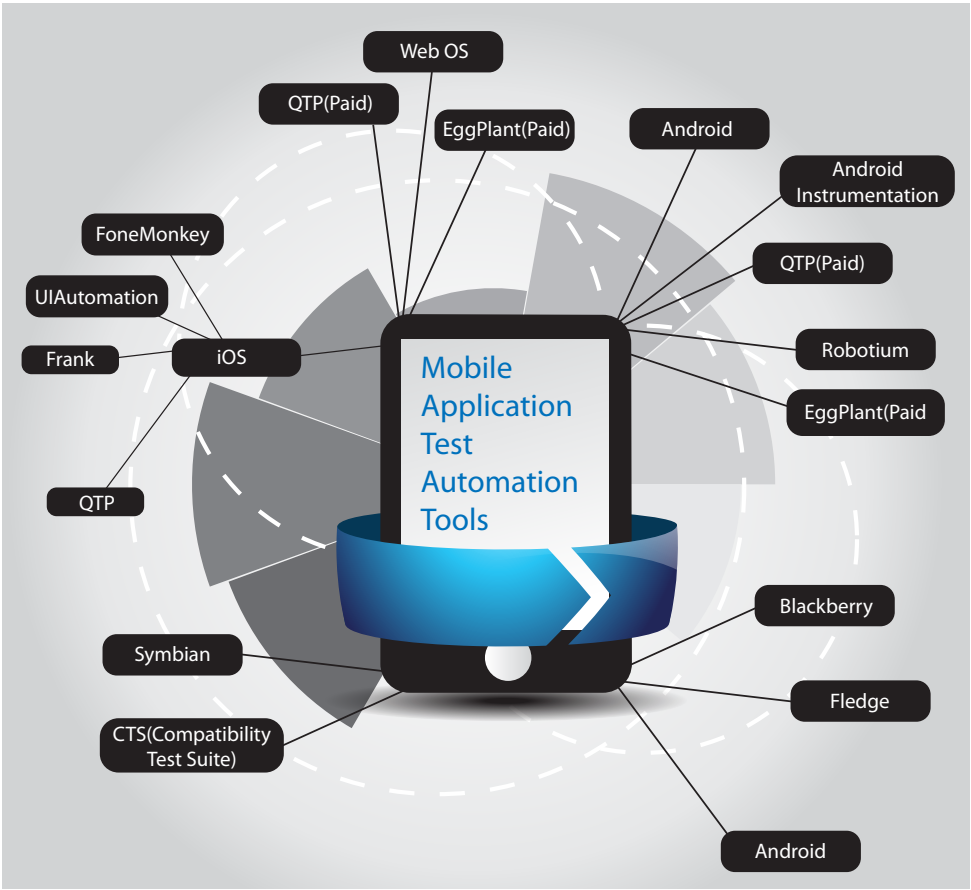

Fig (4) Mobile Application Test Automation Tools

Types of Testing for Mobile Applications

Usability Testing

This includes text visibility in the selected language, navigation between screens, and verification of functionality online/ offline, feedback from interaction with system, i.e., downloaded application should be prompt with message.

Compatibility Testing

This entails validating the application for different mobile devices, OS versions, screen sizes, and resolutions as per the requirements, checking if integration server changes, checking for the app isolation with other apps on the device.

Interface Testing

This covers validation of each screen, buttons, text inputs, navigation flow such as Facebook, bookmarks, reviews, etc.

Services Testing

This includes checking for mobile app not to act as a server, checking if a service takes too long or is used offline, and checking if a service goes down and returns malformed responses.

Low Level Resource Testing

This covers checks for overuse of memory and not releasing it, app temporary files not cleaned, local database growing too big, and garbage generation by the app.

Performance Testing

This includes checks on server connection changes to WIFI from 2G/3G or vice versa, shared images size used for the Application is as per the requirement, application response time, code optimization for the CPU cycle, battery consumption, memory leaks, resources like GPS, CAMERA, etc., freed.

Operational Testing

This entails checks for back-up of necessary information in the app, save and recovery plan if battery goes down, data lost in case of app upgradation from appstore market, app access if user gets any alarm, call, message, reminder, etc., and battery power usage while app is being accessed.

Security Testing

This includes encryption/decryption techniques used for sensitive data communication, checks for multi-user support without interfering with the data between them, checks for access to files saved in the app by any unintended users, detect areas in tested application so that they do not receive any malicious content.

Conclusion

The significant challenges and risks involved in mobile application testing can impact production of mobile apps. These risks and challenges can be mitigated by adopting the various testing types and strategy outlined in this paper.

The various tools available in market for mobile application testing not only help with testing but also provide a platform to measure security and compatibility compliance. This can be useful in application certification where required.

The importance of testing mobile applications before deployment in a live environment cannot be overemphasized. An application with bugs and other issues can hurt not merely business but also the reputation of the organization.

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