Mobile Application Testing

Module 4

Mobile application testing

Mobile application testing is a process by which application software developed for handheld mobile devices is tested for its functionality, usability and consistency. Mobile application testing can be an automated or manual type of testing. Mobile applications either come pre-installed or can be installed from mobile software distribution platforms.

Types of Mobile Testing

There are broadly 2 kinds of testing that take place on mobile devices:

#1. Hardware testing:

- The device including the internal processors, internal hardware, screen sizes, resolution, space or memory, camera, radio, Bluetooth, WIFI etc. This is sometimes referred to as, simple "Mobile Testing".

#2. Software or Application testing:

- The applications that work on mobile devices and their functionality are tested. It is called the "Mobile Application Testing" to differentiate it from the earlier method. Even in the mobile applications, there are few basic differences that are important to understand:

a) Native apps: A native application is created for use on a platform like mobile and tablets.
b) Mobile web apps are server-side apps to access website/s on mobile using different browsers like chrome, Firefox by connecting to a mobile network or wireless network like WIFI.
c) Hybrid apps are combinations of native app and web app. They run on devices or offline and are written using web technologies like HTML5 and CSS.

Basic differences

- Native apps have single platform affinity while mobile web apps have cross platform affinity.
- Native apps are written in platforms like SDKs while Mobile web apps are written with web technologies like html, css, asp.net, java, php.
- For a native app, installation is required but for mobile web apps, no installation is required.
- Native app can be updated from play store or app store while mobile web apps are centralized updates.
- Many native app don't require Internet connection but for mobile web apps it's a must.
- Native app works faster when compared to mobile web apps.
- Native apps are installed from app stores like Google play store or app store where mobile web are websites and are only accessible through Internet.

Challenges

Testing applications on mobile devices is more challenging than testing web apps on desktop due to :

- **Wide varieties of mobile devices** like HTC, Samsung, Apple and Nokia.
- **Different range of mobile devices** with different screen sizes and hardware configurations like hard keypad, virtual keypad (touch screen) and trackball etc.
- **Different mobile operating systems** like Android, Symbian, Windows, Blackberry and IOS.
- **Different versions of operation system** like iOS 5.x, iOS 6.x, BB5.x, BB6.x etc.
- **Different mobile network operators** like GSM(Global System for Mobile Communication) and CDMA(Code Division Multiple Access).
- **Frequent updates** (like android- 4.2, 4.3, 4.4, iOS-5.x, 6.x) – with each update a new testing cycle is recommended to make sure no application functionality is impacted.

Basic Difference between Mobile and Desktop Application Testing

- On desktop, the application is tested on a central processing unit. On a mobile device, the application is tested on handsets like Samsung, Nokia, Apple and HTC.
- Mobile device screen size is smaller than desktop.
- Mobile devices have less memory than desktop.
- Mobiles use network connections like 2G, 3G, 4G or WIFI where desktop use broadband or dial up connections.
- The automation tool used for desktop application testing might not work on mobile applications.

Types of Mobile App Testing

- **Compatibility testing**– Testing of the application in different mobiles devices, browsers, screen sizes and OS versions according to the requirements.
- **Interface testing**– Testing of menu options, buttons, bookmarks, history, settings, and navigation flow of the application.
- **Services testing**– Testing the services of the application online and offline.
- **Low level resource testing**: Testing of memory usage, auto deletion of temporary files, local database growing issues known as low level resource testing.

Types of Mobile App Testing

- **Performance testing**– Testing the performance of the application by changing the connection from 2G, 3G to WIFI, sharing the documents, battery consumption, etc.
- Testing the performance and behaviour of the application under certain conditions such as low battery, bad network coverage, low available memory, simultaneous access to application's server by several users and other conditions. Performance of an application can be affected from two sides: application's server side and client's side. Performance testing is carried out to check both.
- **Operational testing**– Testing of backups and recovery plan if battery goes down, or data loss while upgrading the application from store.
- **Security Testing**– Testing an application to validate if the information system protects data or not.

Types of Mobile App Testing

The fundamental objective of **security testing** is to ensure that the application's data and networking security requirements are met as per guidelines.

The following are the most crucial areas for checking the security of Mobile applications.

- To validate that the application is able to withstand any brute force attack which is an automated process of trial and error used to guess a person's username, password or credit-card number.
- To validate whether an application is not permitting an attacker to access sensitive content or functionality without proper authentication.
- To validate that the application has a strong password protection system and it does not permit an attacker to obtain, change or recover another user's password.
- To validate that the application does not suffer from insufficient session expiration.
- To identify the dynamic dependencies and take measures to prevent any attacker for accessing these vulnerabilities.
- To prevent from SQL injection related attacks.
- To identify and recover from any unmanaged code scenarios.
- To ensure whether the certificates are validated, does the application implement Certificate Pinning or not.
- To protect the application and the network from the denial of service attacks.
- To enable the session management for preventing unauthorized users to access unsolicited information.
- To check if any cryptography code is broken and ensure that it is repaired.
- To validate whether the business logic implementation is secured and not vulnerable to any attack from outside.
- To analyze file system interactions, determine any vulnerability and correct these problems.
- To validate the protocol handlers for example trying to reconfigure the default landing page for the application using a malicious iframe.
- To protect against malicious client side injections. And malicious runtime injections.
- To investigate file caching and prevent any malicious possibilities from the same.
- To prevent from insecure data storage in the keyboard cache of the applications.
- To investigate cookies and preventing any malicious deeds from the cookies.
- Investigate custom created files and preventing any malicious deeds from the custom created files.
- To prevent from buffer overflows and memory corruption cases.

Types of Mobile App Testing

- **Functional Testing**: Functional testing ensures that the application is working as per the requirements. Most of the test conducted for this is driven by the user interface and call flow
- **Laboratory Testing**: Laboratory testing, usually carried out by network carriers, is done by simulating the complete wireless network. This test is performed to find out any glitches when a mobile application uses voice and/or data connection to perform some functions.
- **Installation testing**: Validation of the application by installing /uninstalling it on the devices.
  - Certain mobile applications come pre-installed on the device whereas others have to be installed from the store. Installation testing verifies that the installation process goes smoothly without the user having to face any difficulty. This testing process covers installation, updating and uninstalling of an application

Types of Mobile App Testing

- **Memory Leakage Testing**: Memory leakage happens when a computer program or application is unable to manage the memory it is allocated resulting in poor performance of the application and the overall slowdown of the system. As mobile devices have significant constraints of available memory, memory leakage testing is crucial for the proper functioning of an application
- **Interrupt Testing**: An application while functioning may face several interruptions like incoming calls or network coverage outage and recovery. The different types of interruptions are:
  - Incoming and Outgoing SMS and MMS
  - Incoming and Outgoing calls
  - Incoming Notifications
  - Battery Removal
  - Cable Insertion and Removal for data transfer
  - Network outage and recovery
  - Media Player on/off
  - Device Power cycle
  - An application should be able to handle these interruptions by going into a suspended state and resuming afterwards.

Types of Mobile App Testing

Usability testing: To make sure that the mobile app is easy to use and provides a satisfactory user experience to the customers.

Usability testing is carried out to verify if the application is achieving its goals and getting a favourable response from users. This is important as the usability of an application is its key to commercial success (it is nothing but user friendliness).Another important part of usability testing is to make sure that the user experience is uniform across all devices. This section of testing hopes to address the key challenges of the variety of mobile devices and the diversity in mobile platforms/OS, which is also called device fragmentation. One key portion of this type of usability testing is to be sure that there are no major errors in the functionality, placement, or sizing of the user interface on different devices.

Types of Mobile App Testing

- **Certification Testing**: To get a certificate of compliance, each mobile device needs to be tested against the guidelines set by different mobile platforms.
- The Certified Mobile Application Tester (CMAT) certification exam is offered by the Global Association for Quality Management (GAQM) via Pearson Vue Testing Center worldwide to benefit the Mobile Application Testing Community.
- **Location Testing**: Connectivity changes with network and location, but you can't mimic those fluctuating conditions in a lab. Only in Country non automated testers can perform comprehensive usability and functionality testing.
- **Outdated Software Testing**: Not everyone regularly updates their operating system. Some Android users might not even have access to the newest version. Professional Testers can test outdated software.
- **Load Testing**: When many users all attempt to download, load, and use your app or game simultaneously, slow load times or crashes can occur causing many customers to abandon your app, game, or website. In-country human testing done manually is the most effective way to test load.

Types of Mobile App Testing

- **Black box Testing**: This type of testing doesn't include the internally coding logic of the application. Tester tests the application with functionality without peering with internally structure of the application. This method of test can be applied virtually to every level of software testing: unit, integration, system and acceptance.
- **CrowdSourced Testing**: In recent years, crowdsourced testing has become popular as companies can test mobile applications faster and cheaper using a global community of testers. Due to growing diversity of devices and operating systems as well as localization needs, it is difficult to comprehensively test mobile applications with small in-house testing teams. A global community of testers provides easy access to different devices and platforms. A globally distributed team can also test it in multiple locations and under different network conditions. Finally, localization issues can be tested by hiring testers in required geographies. Since real users using real devices test the application, it is more likely to find issues faced by users under real world conditions.

Mobile Application Testing Strategy

The Test strategy should make sure that all the quality and performance guidelines are met. A few pointers in this area:

1) Selection of the devices – Analyze the market and choose the devices that are widely used. (This decision mostly relies on the clients. The client or the app builders consider the popularity factor of a certain devices as well as the marketing needs for the application to decide what handsets to use for testing.)

2) Emulators – The use of these is extremely useful in the initial stages of development, as they allow quick and efficient checking of the app. Emulator is a system that runs software from one environment to another environment without changing the software itself. It duplicates the features and work on real system.

Types of Mobile Emulators

- Device Emulator- provided by device manufacturers
- Browser Emulator- simulates mobile browser environments.
- Operating systems Emulator- Apple provides emulators for iPhones, Microsoft for Windows phones and Google Android phones

List of few free and easy to use mobile device emulators

- Mobile Phone Emulator – Used to test handsets like iPhone, blackberry, HTC, Samsung etc.
- MobiReady – With this, not only can we test the web app, we can also check the code.
- Responsivepx – It checks the responses of the web pages, appearances and functionality of the websites.
- Screenfly – It is a customizable tool and used to test websites under different categories.

Mobile Application Testing Strategy

3) After a satisfactory level of development is complete for the mobile app, you could move to test on the physical devices for a more real life scenarios based testing.

4) **Consider cloud computing based testing**: Cloud computing is basically running devices on multiple systems or networks via Internet where applications can be tested, updated and managed. For testing purposes, it creates the web based mobile environment on a simulator to access the mobile app.

Mobile Application Testing Strategy

5)Automation vs. Manual testing

- If the application contains new functionality, test it manually.
- If the application requires testing once or twice, do it manually.
- Automate the scripts for regression test cases. If regression tests are repeated, automated testing is perfect for that.
- Automate the scripts for complex scenarios which are time consuming if executed manually.

6) Network configuration is also necessary part of mobile testing. It's important to validate the application on different networks like 2G, 3G, 4G or WIFI.

Sample Test Cases for Testing a Mobile App

In addition to functionality based test cases, Mobile application testing requires **special test cases** which should cover following scenarios.

- **Battery usage**– It's important to keep a track of battery consumption while running application on the mobile devices.
- **Speed of the application-** the response time on different devices, with different memory parameters, with different network types etc.
- **Data requirements** – For installation as well as to verify if the user with limited data plan will able to download it.
- **Memory requirement**– again, to download, install and run
- **Functionality of the application**– make sure application is not crashing due to network failure or anything else.