



Mobile Applications Certification

“There is probably an app for that”



White Paper – September 2011

www.globalccf.org

1- Introduction

It can readily be said that just 10 years ago if one were to refer to the words “mobile applications” in day to day conversation to the general consumer, it would either be perceived with a look of confusion, or to the more technically savvy would probably refer to a game like “Pacman” that could be downloaded onto the mobile phone. Today, however, the word application or “apps” has a quite broader meaning to the general populous, where it refers to a tool that in general, enhances one’s way of life in some aspect. And in today’s day and age it is quite probable that tool is a software program that runs on a mobile device that goes by the name of iPhone or Android. In less than 5 years, companies like Apple and Google have transformed the way the general consumer understands and uses their mobile devices. Today, it is not uncommon to hear various types of applications that are available for download from popular store fronts like iTunes or Google Market Place that are consumed for entertainment, gaming, productivity, social networking, and even for enterprise work purposes. Often these applications are offered “free of charge”, thereby increasing awareness and adoption, while at the same time offering full versions of paid applications/services which the consumer is now more willing to subscribe to. In fact, often when one typically has a problem that needs solving, it’s not uncommon to hear the joke that “there’s probably an app for that”. The Apple and Google phenomenon has spurred other players to rush to place a stake in the lucrative mobile applications value chain, from OEMs offering devices that support these popular platforms, to Operators, who are looking to monetize their network assets and be the last mile of the application/service to the end user, to Industry Consortiums such as Wholesale Applications Community (WAC), who are generating application platforms or middleware platforms that sit on top of the OS and which are in some cases complementary to these platforms, to application providers who now have a much larger choice in ecosystems when building innovative new applications. These ecosystems have also opened up opportunities for other players who now have the ability to carve a niche of their own based on their areas of expertise. These include firms, for example, who are involved in mobile security to ensure that sensitive user information is not compromised, to firms that are developing compression algorithms to ensure that the increase in data usage is mitigated by more efficient ways of transporting data over the mobile network, etc. While all of this change and spark in innovation has benefited the community, it also raises questions on how well these applications and services perform in the live network, with regard to the level of Quality Control, Assurance and Service that is put in place by the service providers to ensure the consumer has a positive user experience.

This paper is part of a two part series that attempts to demystify the overall realization and commercialization of applications & services in a wireless ecosystem. Specifically, this paper looks at some of the challenges that are related to Application and Device Certification in the market today with some potential solutions and opportunities that are available to ensure this can be done and managed properly.

2- The complexities of a multi-player ecosystem

Ever since mobile applications first began appearing on Feature phones & subsequently Smartphones, Mobile Operators have had an increasingly difficult time in ensuring these applications not only functioned properly as per their design, but also interoperated on the terminal device by the OEM, and were not detrimental in their behavior to the wireless network. The various flavors of application commercialization can range from pre-loading the application on the device, making the application available for download from an Operator's supported storefront once the device has been commercialized, and/or to open up the device to Over the Top applications that can be readily downloaded from any internet site. Each of these methods introduce its own set of challenges, with the pre-loading of applications requiring the greatest level of effort since it requires tight integration of the application into the native software of the phone, and subsequent support for the application via Operator channels once the application is available in the market. With the advent of Smartphones and more open operating systems, these issues have somewhat alleviated, although the very ease of developing for Smartphone platforms introduces a whole new slew of issues that Operators now have to tackle.

The core of the application realization challenges arise from the fact that now an external software element, i.e. the application, is being introduced to the terminal system that is being developed by a 3rd party application developer, and this piece of software, for pre-loaded apps, had to be integrated into the native software of the terminal device. For downloadable apps, this is less of a problem, although changes to terminal software on already commercialized devices for applications are limited. The traditional 2 player ecosystem, consisting of the Operator and OEM, has now changed to involve the Application Developer, who has a critical role in the overall application realization process to ensure to the end user, that the application is merely an extension of the native device user experience. To compound this issue, Operators are also commercializing multiple SKUs of products consisting of various OEM devices and device platforms that are all integrating the same application and requiring the same look, feel and user experience.

Given that application developers themselves can vary in their level of maturity and experience in developing applications for wireless devices, this characteristic in itself can define whether the realization of that application is fast and efficient, or mired with issues that impact the time to market and cost of realizing that application. Although a given application might be unique and have a legitimate business case, the process by which that application is introduced and managed in the market can play a part in how successful that application will be.

As can be seen from above, the various complexities of the application realization ecosystem can introduce a range of issues for the Operator and end-consumer, ranging from functional issues on the application itself, to more critical issues thus introducing behaviors that can impact other users and subscribers on the network. It is these range of issues that the Operator must mitigate and ensure are not present in order for an application to be successful. Failure to do so may result in end users not adopting the application/service, to more serious issues such as customer churn if the application/service is detrimental to other aspects of the wireless service.

3- Application Certification Solutions

The main solution to all of these challenges and issues is to ensure that sufficient Quality Control and Assurance is present in the realization system to eliminate many of these issues before the application is commercialized in the market. The key focus here is not just identifying *what* areas to test, but *how* to test and the overall robustness of the QC and QA process.

3.1 Multi-Level Testing

Before deploying any type of application or service, it is critical for the service provider to ensure that the services are validated from several perspectives before the service can be deployed into the market. This includes not just looking at service functionality or service conformance, i.e. does the application do what it is supposed to do, but to also look at service performance, behavior, interoperability with the device and network, as well as user acceptance testing (UAT), i.e. validating the service from an end user perspective. Often these sets of tests are accompanied by a friendly user trial, involving a small and controlled group of individuals who have access to the service for a certain period of time across the carrier network, and who can identify any potential issues that need to be resolved before the service is offered to a larger user base.

For each target area specified below, testing should involve executing a set of positive test cases, i.e. ensuring the application or service does what it is supposed to do, as well as a set of negative test cases, i.e. ensuring the application or service does not do certain things. The latter is quite important given the myriad of applications that can enter the wireless ecosystem. More often than not, it is more critical to ensure that the application does not exhibit certain behavior, which might prove detrimental to the network it is operating on.

3.1.1 Service Conformance Validation

Service Functionality or Conformance validation is the most basic type of testing that can be done to ensure the application is working properly both locally on the device and while interfacing with the network. The basic premise involves identifying the set of functions that the application gives the end user access to, and to develop a test case or script that can run through those functions to make sure that each and every component is functioning as per the specifications. Depending on the type of application and platform it is being run on, the process for executing these tests can vary; however, all of these involve some form of manual testing by a tester following a test procedure and validating & logging the results, as well as some form of automated testing that is typically run on a test rack with the aid of test scripts. It is important to ensure that regardless of whether a test is executed manually or if it is automated, there should be a procedure to take Over the Air (OTA) Logs of the traffic between the terminal device and network, and similarly server side logging between the various network elements to ensure that each and every call-flow and the messaging in those call flows are reflective of the correct information that should be sent between the device and network. Not validating this can pose risks which may impact, for example, how billing is done (if the right messages are not received by the billing server) especially if real-time billing is supported for both post-paid and pre-paid subscribers.

While the full set of conformance tests covers end to end functionality, it does not necessarily cover how those functions are accessed in various scenarios, such as during peak traffic time, in roaming environments, etc.

3.1.2 Service Performance Validation

Service Performance Validation involves testing the service to make sure it meets certain minimum performance standards, including: measuring load time of the application, round trip latency of various function calls in 2G, 3G and 4G systems, data retry mechanisms in place, testing in roaming scenarios between 2G, 3G and 4G systems, measuring data throughput for applications that are bandwidth intensive, Quality of Service (QoS) for various scenarios, etc. Unlike the Service Conformance tests, which focus mainly on validating *if* a specific functionality works, Service Performance tests focus mainly on *how* a specific set of functionalities work under various network conditions or scenarios. Performance is measured both at the network level and locally at the device level.

While in some instances Service Performance test cases can be run in an emulated environment, it is most often done in a live network environment since performance is related to not just the application or device, but on the geographic characteristics of the network as well as the capacity or loading of the network. Performance benchmarks should be established where possible to gauge how well the service is performing under certain scenarios and conditions. These can be done using a reference device, as an example, that has already been commercialized with the application or service.

3.1.3 Application Device Interoperability

The focus of the Application Device Interoperability is to ensure that the Application that is residing on the device interacts properly with the device platform that is supporting that application. This portion of the tests is done only when the device dependencies and access to device capabilities (via Device API's) needed by the application have been identified to be supported by the device. These sets of tests ensure that any of the function calls that invoke device capabilities, such as accessing GPS functionality, Telephony functionality, Camera functionality, etc., are done properly and the function call returns a success value, or appropriate error handling for non-success values. Often these sets of tests can be combined with the overall Service Conformance tests for more efficient testing, however it is often better while performing a single test to keep a separate status of results, since one is evaluating the application functionality as a standalone item, while the other is evaluating the application interaction with the device. This is all the more important for cases where although it would seem the specific application function is being executed properly, in reality it is not. For example, an application that decides to shut down the GPS tracking functionality can notify the user via the User Interface of the action, but in reality an error in the function can cause the GPS component to still be enabled and waiting for a particular command from the application to terminate the process.

Many times it may be helpful if an application with Debug Mode enabled is used to conduct the tests, since application level logging can be done to ensure whether the right function call return values are being sent back or not.

3.1.4 Application Network Interoperability

The focus of Application Network Interoperability is to ensure that the Application interaction with the Carrier Network is done in a manner that falls within the guidelines as determined by the Carrier. This is especially important for Carrier supported applications, since for those services the Carrier is typically interfacing with the end consumer to ensure their satisfaction with the application and service.

Application Network Interoperability tests involve testing the application and focusing on those functionalities that typically impact network resource usage and billing of the service. This could involve monitoring how much data an application or service is allowed to move over the network in a given session and ensuring it is within a specified guideline, or the manner in which an application retries to connect to the network if a connection to the server is lost, or even how much signaling traffic is generated (typically non-chargeable) in order to get the application's sessions up and running. Tests for real time and non-real time charging are also conducted to ensure proper revenue assurance.

If the service is being offered under various service level plans based on pricing, Quality of Service (QOS) tests should be executed to note whether the correct level of service is in place for the particular rate plan.

3.1.5 User Acceptance Testing (UAT)

User Acceptance Testing or UAT is critical in the final phase prior to launching the application or service. The reason why this is done last, is to ensure that before the app or service is launched, all components of the overall testing have been conducted and any issues are resolved prior to UAT testing. Since the purpose of UAT testing is to validate the application or service from the end user usage perspective, it is imperative that the experience be similar to that of what an end subscriber would be seeing. This will allow the testing team to determine how well the application or service really works and whether there is a need to modify the design in any way.

Unlike the other test areas, where specific test cases are identified and executed based on a pre-determined procedure, UAT testing can involve identifying a set of high-level use cases of how an end consumer may use the service. The steps to actually execute those use cases are left up to the testing group so as not to influence their first impressions of the service or to manipulate the outcome of the user experience.

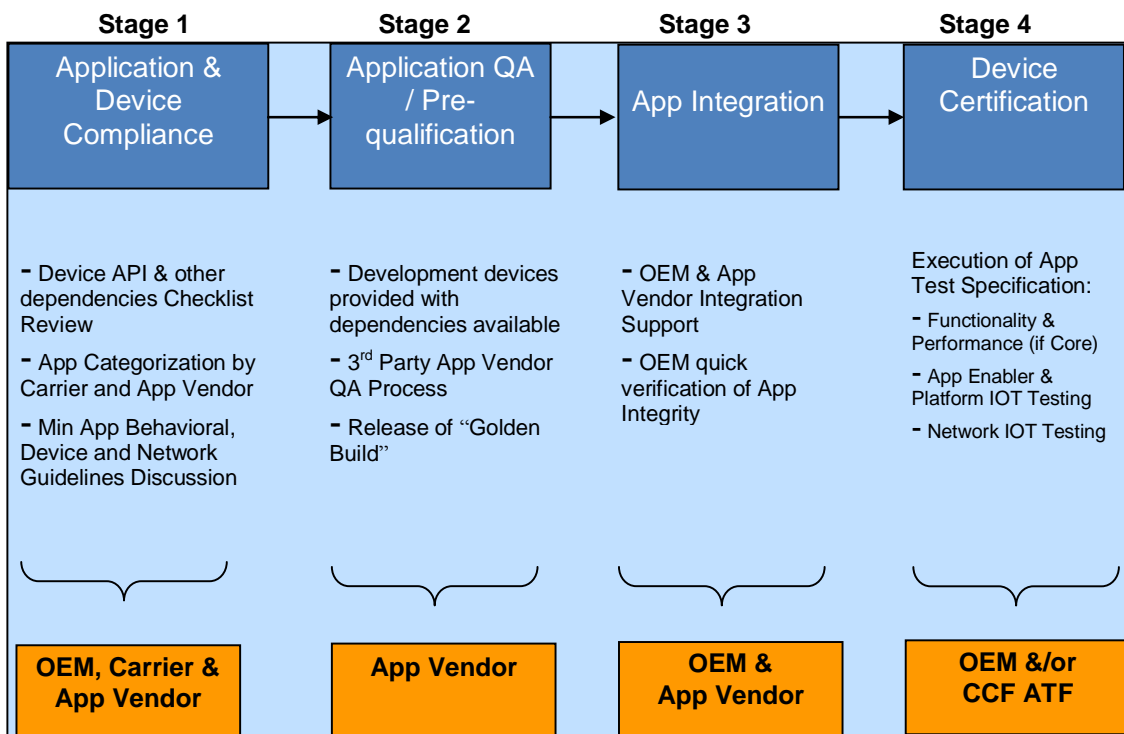
UAT typically uses the application in a live network under real world conditions, i.e. with the tester utilizing the service over a period of time (usually days) at different hours of the day and in different geographic regions where the service is still offered.

Any feedback from UAT testing can be channeled back to the Client Support groups so that all teams are prepared for any circumstance, once the service is launched.

3.2 Testing Best Practices

For all of the above-mentioned tests, it is important to note that the success of the execution of these tests is dependent on how well the organizational processes that are in place are followed. This is needed in order to allow the various interdependent parties to know their Roles & Responsibilities as it relates to the testing. A well defined testing process based on Gates or Stages of development, such as those defined by the Project Management Institute, should be in place where it is clear what the Inputs, Execution Activities, and Outputs for each stage of the process are. To make these processes successful, the major stakeholders in this process will have to ensure they not only deliver to their mandate, but are accountable for any outcomes, positive or negative.

A typical 4-stage process for Application Realization as defined by the CDMA Certification Forum is depicted below:



For a full description of the overall process, please refer to the CCF's Application Testing Best Practices Process document in the members section at www.globalccf.org.

4- Application Testing within the CDMA Certification Forum

The CDMA Certification Forum (CCF) is currently involved in developing Application Testing Strategies for Operators and Manufacturers, such that many of these specific challenges and issues can be tackled prior to a terminal device entering an Operator's lab. These testing strategies involve developing industry wide Application Test Plans and Specifications for various application categories, as well as Application Testing Best Practices documents that can allow an operator to ensure all the pre-requisites before and during testing are met.

The Application Testing Program within the CCF allows prioritizing on an ongoing basis the key applications currently being offered by Operators in the market. These test plans form a common baseline across multiple operators globally and are developed based on industry standards such as 3GPP2, Open Mobile Alliance (OMA), World Wide Web Consortium (W3C) and others. For application areas that are not currently standardized by the industry, the CCF is developing a common standard based on contributions from Operators and Manufacturers.

Tools such as these developed by the CCF, allow for Operators, OEM's and Application Vendors, speak a common language when developing and testing new applications and services. This standardized approach ensures the total cost of ownership of applications and devices are lower and involved parties can benefit from greater economies of scale.

For more information on CCF, please visit the CCF website at <http://www.globalccf.org>.

5- Conclusion

In conclusion, it can be seen that while the market will dictate the success or failure of any application or service, the Operator, Manufacturer and Developer Communities can ensure that with proper up front due diligence in the design, implementation and certification of the application and terminal device, many of the potential issues that can threaten the road to success can be eliminated.

Variants of these strategies should be developed for both Consumer and Enterprise markets and depending on the target vertical market, extra emphasis should be given to those areas, which are important to that specific market. For example, for applications targeted to the financial industry, areas such as application security should be thoroughly tested.

While any one solution cannot possibly solve all application realization challenges, a well-defined process adopted within an organization, combined with a set of test solutions that methodically tackles application functionality and interoperability with device and network can help alleviate many of the challenges that are faced by operators and manufacturers today.

Participating in groups such as the CDMA Certification Forum, allows Operators, Manufacturers and/or Application Developers greater understanding of the issues at hand, and allows them to work collaboratively to develop solutions that can mitigate or eliminate these issues.

Copyright © 2011 - CDMA Certification Forum (CCF). All rights reserved. Unpublished rights reserved under U.S. copyright laws. The CDMA Certification and the CDMA Certification Forum logo are trademarks of the CDMA Certification Forum. All other trademarks are the property of their respective owners. ® Indicates registration in the United States. Specifications are subject to change without notice.