

Statement of Work (SOW)
Android Internals Software Training
Period of Performance: 5 consecutive days

The CONTRACTOR shall provide engineering training services to NASA employees. The subject matter being requested should focus on training related to the internal workings of the Android operating system and thus providing the team the knowledge necessary to gain access to underlying hardware and services on mobile devices. The training will cover the subject matter in lecture form and with hands-on exercise sessions, with an emphasis on hands-on exercises. These hands-on exercises shall be done on actual development board hardware (not virtual machines). The training shall be provided over a course of 1 work week (5 consecutive days) on-site (NASA Kennedy Space Center, Florida) and to a class of at minimum 9 people. The following topics shall be covered as part of these training services:

- Overview of the Android platform architecture.
- The design and software architecture of an embedded system based on the Android operating system.
- Introduction to the structure and lifecycle of Android applications
- The development method for building, customizing, installing, and using the Android operating system in embedded systems.
- The integration of the Android operating system with the underlying embedded hardware using the appropriate interfaces.
- The design, development and debugging of Android applications, device drivers, and kernel & bootloader modifications.
- An overview of the Android Stack Module and the four layers (Kernel, Native, Application Framework, Applications Layers) that make it up. This should include an explanation of the anatomy of the Android platform and an understanding of the physiology (layer interactions)
 - Details on the Android Kernel Layer including how it has been extended from the standard Linux kernel and how the upper layers of the Android OS interact with these extensions

- Details on the Android Native Layer and its functions
- Details on the Android Application Framework Layer
- Details on the Android Applications Layer including an understanding of the basic structure of an Android application and how it is distributed as an Android Application Package (APK).
- The fundamentals of the Android Java Native Interface (JNI) & Native Development Kit (NDK), including the ability to build native applications in Android using JNI and NDK
- Details on the essentials of Android Security and how to define and enforce custom permissions to restrict access to system extensions
- Details on the Android system startup including bootloading the kernel, launching standard Linux daemons, and initializing a variety of Binder-based system services. Including how to customize the system boot process through custom init scripts.
- Details on how to build the Android OS from Source
- Details on multiple Android Subsystems including an architectural overview of these systems services. The details of how to build, customize, install, and use each Android software component in an embedded system. Subsystems discussed should at minimum include the following: Power Services, Package Service, WiFi Service, Location Service, Android Media Framework, Telephony, Camera Service, and NFC Service
- Details on creating a customized Android System Image. This should include how to implement customizations at all Android stack levels, including custom kernels, HAL user-space libraries, executables, daemons, Java libraries, system applications, and Binder-based system services.
- The idiosyncrasies of using open source and free software packages in the design and development of embedded systems.

The training must be completed by 06/05/2015