G1 - Android Installation

Android installation on a hardware platform

Objectives

- Understanding the specifics of the Android system.
- How to configure and compile the Android sources to get a working system.
- Control the operation of the Android emulator.
- Understand how to test an Android image before flashing the system.
- Detail the different flash file system image generation procedures.

Labs are conducted on i.MX6 or i.MX8 boards
We use the last open source version of Android, as available on the board.
For on-site trainings, if suitable Linux workstations are not available, we provide virtual machine images for VirtualBox; in all cases the requisite is a recent 64bit PC (at least 4 cores) with at least 32Gb of RAM (16Gb may work but will be slow) and 400Gb of free disk space.

Course environment

- Printed course material (in English).
- One Linux PC for two trainees.
- One target platform for two trainees.
- Documentation and exercise solutions.

Prerequisite

- Embedded Linux installation and kernel usage

Target Audience

- Any embedded systems engineer or technician with the above prerequisites.

Course Outline

First Day

Android overview

- Android
  - History
  - The Open Handset Alliance
  - Existing ports (HTC Dream, Magic...)
- The various licenses used by Android (GPL, LGPL, etc.)

The GIT distributed source management system

- Installation and general usage.
  - Creating and using a local repository
  - Connecting to a remote repository

Exercise: Managing several versions of a program with GIT

- Working with branches

    - Creation of a new branch
    - Merging branches

Exercise: Working with vendor branches

- Team functions
    - Creating configuring and managing a public repository
    - Working with patches

Exercise: Creating a shared project repository

The Android Linux kernel

- Downloading source code
- The Android-specific drivers
    - Binder
    - Logger
    - Low_memory_killer
    - Timed_output
    - Timed_gpio
- The Generic Kernel Image

Second Day

Booting Android

- The Linux boot process
- The Android boot sequence
- The Android Initialisation language

The Android System

- Downloading sources
- Exploring the Android system
- The Android source tree
    - The Bionic library
    - The Dalvik Java virtual machine
    - The basic packages
- Building the Android system

Exercise: Compiling the full Android system

The Android BSP

- The Android build system
    - The Android.mk files
- Creating a new Android platform
    - Declaring a new vendor
    - Creation of platform-specific parameter files
    - Choosing platform-dependent compilation options

Exercise: Compiling a new Android platform

- Adding native components
    - Defining Java methods in C++
    - The Android NDK
    - JNI for Android
    - Using SWIG
- The Android binder
    - Writing services in C++
    - The binder's C++ interface

Exercise: Recompiling a single component

Third Day

The Android SDK

- Overview and installation of the Software Development Kit (SDK)
- The Android Virtual Devices
  - Creation
  - Configuration
  - Basic Use
- The Eclipse Android Development Toolset (ADT)
  - Developping and testing and Android application
  - Deploying Android Applications
- The Android Debug Bridge (adb) tool
  - Basic use
  - Connecting to a remote Android target (real or virtual)

Exercise: Building and testing a simple Android application

Finalization of the Android platform

- Flash memory partitionning
- Flashing the system
  - Flashing through u-boot
  - Flashing from Linux
- _ Updating the initailisation script when booting in flash
- Starting and using the platform in standalone mode

Exercise: Deploying a finalized Android system