

Android™ In Industrial Applications – A Field Report



Zuverlässige
Qualität
Made in Germany



Contents

▣ What we will talk about

- ▣ Garz & Fricke Company Overview
- ▣ Introduction to Android
 - ▣ Scope
 - ▣ History
 - ▣ Versions
 - ▣ Architecture
- ▣ Relevance of Android for Industrial Applications
- ▣ Application development on Android
- ▣ Porting Android
- ▣ Field report

Company Overview

Garz & Fricke

- Located in Hamburg, Germany
- Employees: 86
- Founded in 1992
- Three business units:
 - Embedded Systems
 - Vending & Telemetry
 - Electronic Manufacturing Service
- Embedded Systems since 1998
- Android Development since 2010



Embedded Systems Introduction

◆ Facts

- ◆ Touch panels, SBC (single board computers) and computer modules
- ◆ Hardware and software development
- ◆ Standard products
- ◆ Custom OEM designs
- ◆ Windows CE, Linux and Android services
- ◆ Freescale partnership
- ◆ Microsoft Embedded partnership



Android Introduction

What is Android?

- Android™ delivers a complete set of software for mobile devices: an operating system, middleware and key mobile applications.

(http://www.openhandsetalliance.com/android_overview.html)

- Designed for handheld devices
- General-purpose framework for many applications



Android History

◆ History of Android

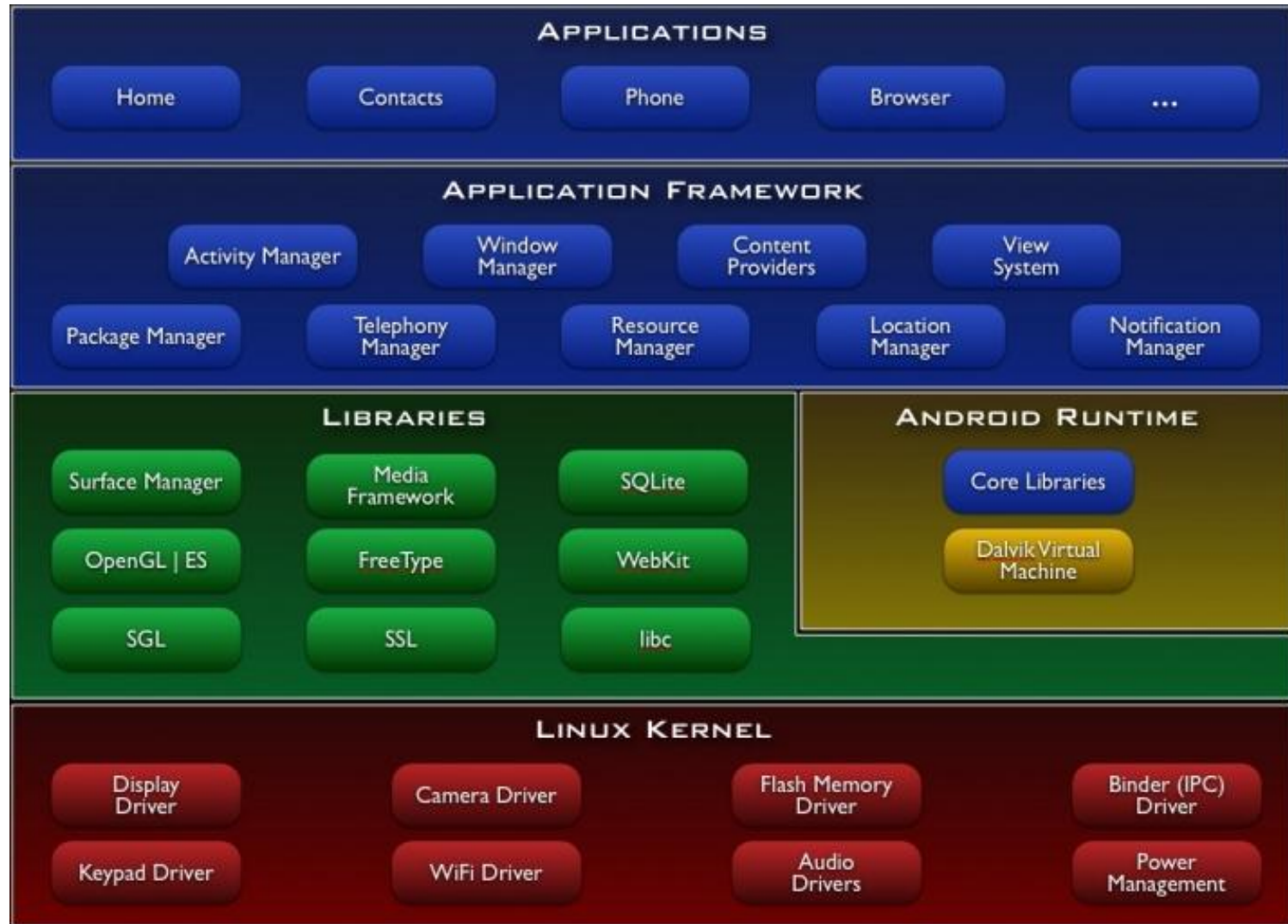
- ◆ Initial developer: Android, Inc., founded in 2003
- ◆ Bought by Google in 2005
- ◆ November 2007: Formation of the Open Handset Alliance
 - ◆ A consortium of over 80 companies (network providers, handset manufacturers, semiconductor vendors, software vendors)
 - ◆ Aim: Improve the consumer's mobile phone experience
 - ◆ Membership is not required to use Android in a device, but provides early access to new releases
- ◆ October 2008: First commercial product, HTC Dream
- ◆ October 2008: Android is released as open source under the Apache license
- ◆ 2011: Best selling smartphone O/S (52% market share)

Android Versions

Version	Codename	Released	API Level	Distribution
1.5	Cupcake	4/09	3	0.3%
1.6	Donut	9/09	4	0.6%
2.0	Eclair	10/09	7	5.2%
2.2	Froyo	5/10	8	19.1%
2.3	Gingerbread	12/10	9	0.4%
2.3.3		2/11	10	64.6%
3.0	Honeycomb	2/11	12	0.7%
3.2		7/11	13	2%
4.0	Ice Cream Sandwich	10/11	14	0.4%
4.0.3		12/11	15	6.7%
4.1	Jelly Bean	6/12	16	0%

<http://developer.android.com/about/dashboards>

Android Architecture



<http://developer.android.com/images/system-architecture.jpg>

Android Relevance for industrial applications

◆ Why is Android relevant for industrial applications?

- ⊞ Nice user interface
- ⊞ Open Source, no license fees
- ⊞ Easy application development
- ⊞ Many features already integrated:
 - ⊞ Connectivity: 3G/4G modems, Bluetooth, Wi-Fi, USB, TCP/IP
 - ⊞ Multimedia: Audio/Video playback and recording, OpenGL/ES
 - ⊞ Sensors: Light, Temperature, Pressure, Proximity, ...
 - ⊞ Power Management
 - ⊞ Security

Android Application development

What do I need for Android application development?

- ❖ O/S-independent (Linux, Windows, OS/X)
- ❖ JDK
- ❖ Android SDK:
 - ❖ Emulator
 - ❖ Android Debug Bridge (ADB)
- ❖ Eclipse with Android ADT plugin



Android Porting

◆ What do I need for porting Android to my hardware platform?

- ⊞ Porting Android is much harder than developing applications, very few documentation
- ⊞ Google provides Android and kernel source code in git repositories
- ⊞ First, bring up the Linux kernel, then Android
- ⊞ CPU vendors might provide modified source code, optimized for their processors
- ⊞ Android has a lot of features which are not needed in an industrial device (e.g. Phone dialer, Contact list, etc.), not easy to remove
- ⊞ Java APIs for industrial interfaces (RS232, RS485, CAN, etc.) have to be implemented

Android Field report

◆ Garz & Fricke customer project: Access control & workforce management system



- ◆ Freescale i.MX53 (Cortex-A8)
- ◆ Capacitive touchscreen & buttons
- ◆ Ethernet, Wi-Fi, USB, RFID
- ◆ Camera with flashlight
- ◆ Android 2.3.3 Gingerbread
- ◆ Kernel 2.6.35
- ◆ APIs for RS232, I²C, GPIO
- ◆ Touch calibration app

Android Summary

◆ What have we learned today?

⊞ For application developers:

- ⊞ Android delivers a very large and easy-to-use framework for application developers
- ⊞ Good documentation, books available

⊞ For platform developers:

- ⊞ Android does not provide APIs for industrial interfaces and devices
- ⊞ Android needs hardware graphics acceleration to work smoothly
- ⊞ No documentation, no books



Garz & Fricke