A topics about Android Compatibility and the way to check it

Shinsuke Kato
(Panasonic)

Firstly…

- Have you done “build Android” ?

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- Do you know “andorid-xxx/cts folder” ?

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- Have you run “$ make cts” ?

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- Do you know “andorid-xxx/cts folder” ?
- Have you run “$ make cts” ?
- Have you run below ?

  “ $ startcts ”

  “ > start --plan CTS ”

BTW.

I heard…

- The developers who make Application and release it on Android-Market say :

  “ Application test for the real device is a hard work. It’s so terribly ! There are a lot of devices all over the world!”

It is called “Android Fragmentation”, maybe.

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But, I'm a embedded developer. So…

- My interest is "porting Android to the other device"
- I'm not interest in "Test for Applications"

And, I work for the maker. So…

- Many Applications SHOULD be able to run normally (without Halt) on Our Device!
- Of course, use the latest Android version.

How care ?

What is CTS ?

- It's a "Compatibility Test Suite" for Android.

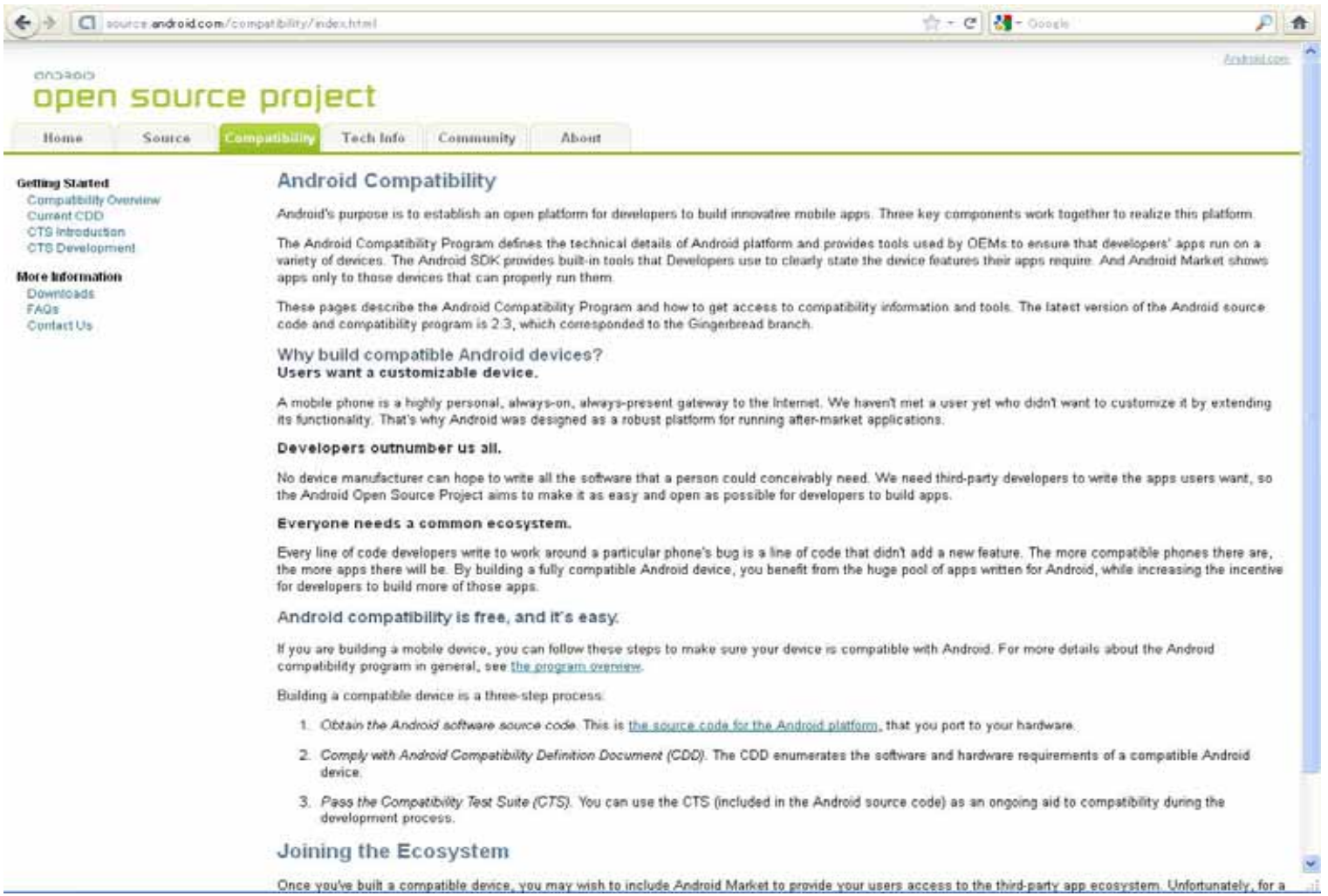
- To say simply, it's a test for API
- On Android 4.x, CTS has about 18,000 test cases
  - On Android 2.3.x, CTS has about 13,000 test cases

Second…

- Do you know
  “CDD”
  and/or
  “android-4.0-cdd.pdf” ?

Android Compatibility

- http://source.android.com/compatibility/index.html



What is CDD ?

- The official name is "Android Compatibility Definition Document", and it is called "CDD".
- CDD is on the web. "android-4.0-cdd.pdf" is the latest one.
- CTS describes the definition of "Software".
- Then, what is the definition of "Hardware"?

  -> CDD describes !
- "android-4.0-cdd.pdf" was debut on Dec. 2011.
  - 2010/12/17 : android-2.3-cdd.pdf
  - 2011/02/25 : android-2.3.3-cdd.pdf
  - CDD for Honeycomb is not on the WEB
- In my Session, I use below:
  - android-4.0-cdd.pdf = CDD-4.0
  - android-2.3.3-cdd.pdf = CDD-2.3.3

Today's Content

- 1st half
  - What does CDD-4.0 describe?
  - What is the difference between CDD-2.3.3 and CDD-4.0 ?
- 2nd half
  - How to check ?

Contents of CDD

1. Introduction, 2. Resources

Chap.	Abst.	Topic
1 Introduction	To be compatible with Android 4.0, the device implementer meet the requirement which this document says.	The used word : must, must not, required, shall, shall not, should, should not, recommended, may, optional (This is per the IETF standard defined in RFC2119.) On CDD-2.3.3, “Android-compatible devices running Android 2.3 MUST ship with version 2.3.3 or later.” On CDD-4.0, the comment above is deleted.
2 Resources	References	There are 59 References (URL). On CDD-2.3.3, there are 43 references.

1. Introduction

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- CDD-2.3.3
  - This document enumerates the requirements that must be met in order for mobile phones to be compatible with Android 2.3.
- CDD-4.0
  - This document enumerates the requirements that must be met in order for devices to be compatible with Android 4.0.

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3. Software (1/5)

Describe the requirement of "Software"

Chap.	Abstact	Topic
3.1 Managed API Compatibility	API (Sum:20,000 method) are implemented (Core Android Java-language APIs (http://developer.android.com/reference/packages.html) define the implementations)	If they don't change the Android API, the test is needed or not ? If they don't implement the "Hardware", see the Chap.7 in such case. The content of reference (URL) is updated when Android is updated…

3. Software (2/5)

Chap.	Abstract	Topic
3.2 Soft API Compatibility	Must support and set all Permission	If don't change the setting of Permission, the test is needed or not ?
	Must set Build Parameters On some fields, "The value of this field MUST be encodable as 7-bit ASCII and match the regular expression "^[a-zA-Z0-9.,_-]+$".	They MUST set the all parameters.
	MUST support "Intent" of the application below: Desk Clock, Browser, Calendar, Calculator, Contacts, Email, Gallery, GlobalSearch, Launcher, Music, Settings	On CDD-2.3.3, Calculator, Email are described. On CDD-4.0, above two application are not described.

3. Software (3/5)

Chap.	Abstract	Topic
3.3 Native API Compatibility	MUST include support for code running in the managed environment to call into native code, using the standard Java Native Interface (JNI) semantics. (libc, libm, JNI interface, libz, liblog, OpenGL, etc.)	
3.4 Web API Compatibility	MUST be based on the 534.30 WebKit The WebView component SHOULD include support for as much of HTML5	On CDD-2.3.3, MUST be based on the 533.1 Webkit
3.5 API Behavioral Compatibility	•MUST NOT change the behavior or semantics of a standard Intent •MUST NOT alter the lifecycle or lifecycle semantics of a particular type of system component •MUST NOT change the semantics of a standard permission	To say simply, they don't change the Android System ?
3.6 API Namespaces	•MUST NOT modify the publicly exposed APIs on the Android platform by changing any method or class signatures, or by removing classes or class fields.	

3. Software (4/5)

Chap.	Abstract	Topic
3.7 Virtual Machine Compatibility	MUST support the full Dalvik Executable (DEX) bytecode specification and Dalvik Virtual Machine semantics	**Screen Size / Screen Density / Application Memory** **ldpi / mdpi — 16MB** **tvdpi / hdpi — 32MB** **xhdpi — 64MB** **xlarge — mdpi — 32MB** **xlarge — tvdpi / hdpi — 64MB** **xlarge — xhdpi — 128MB** On CDD-2.3.3, ldpi/mdpi 16MB, hdpi/xhdpi 24MB
3.8 User Interface Compatibility	Req. for User Intarface (Widgets, Notifications, Search, Live Wallpapers, etc.)	CDD-4.0, "must be capable of rendering widgets that are 4 x 4 in the standard grid size" is added. CDD-4.0, "Recent Application Display" "Input Management Settings" are added

3. Software (5/5)

Chap.	Abstract	Topic
3.9 Device Administration	Device Administration API is added. MUST provide the implementationof the DevicePolicyManager class.	
3.10 Accessibility	Device implementations MUST provide an implementation of the Android accessibility framework consistent with the default Android implementation.	
3.11 Text-to-Speech	MUST support the Android TTS framework APIs and SHOULD include a TTS engine supporting the languages available on the device. MUST support installation of third-party TTS engines. MUST provide a user-accessible interface that allows users to select a TTS engine for use at the system level	the upstream Android open source software includes a full-featured TTS engine implementation.

Describe the format of Android Application

Abstract	Topic
MUST install and run Android ".apk" files as generated by the "aapt" tool included in the official Android SDK MUST NOT extend either the .apk, Android Manifest, Dalvik bytecode	Do you change ?

5. Multimedia Compatibility(1/4)

Device implementations MUST include at least one form of audio output, such as speakers, headphone jack, external speaker connection, etc.

Chap.	Abstract	Topic
5.1 Media Codecs	Media Decoders(MUST) –Audio:ACC LC/LTP, HE-ACCv1/v2, AMR-NB、AMR-WB, FLAC, MP3, MIDI, Vorbis, PCM –Image:JPEG, GIF, PNG, BMP、WEBP –Video:H.263, H.264, MPEG4SP, VP8 Media Encoders(MUST) –Audio:AAC LC/LTP、AMR-NB, AMR-WB –Image:JPEG, PNG、WEBP –Video:H.263, H.264	On CDD-2.3.3, "H.264 encoder is "SHOULD" and "Note that the Compatibility Definition for a future version is planned to change this requirement to "MUST"" On CDD-4.0, H.264 is "MUST"

5章 Multimedia Compatibility（2/4）

<table>
<tr><th>Chap.</th><th>Abstract</th><th>Topic</th></tr>
<tr><td>5.2 Video Encoding</td><td>Android device implementations that include a rear-facing camera and declare android.hardware.camera SHOULD support the following video encoding profiles.
<table>
<tr><th></th><th>SD (Low quality)</th><th>SD (High quality)</th><th>HD (When supported by hardware)</th></tr>
<tr><td>Video codec</td><td>H.264 Baseline Profile</td><td>H.264 Baseline Profile</td><td>H.264 Baseline Profile</td></tr>
<tr><td>Video resolution</td><td>176 x 144 px</td><td>480 x 360 px</td><td>1280 x 720 px</td></tr>
<tr><td>Video frame rate</td><td>12 fps</td><td>30 fps</td><td>30 fps</td></tr>
<tr><td>Video bitrate</td><td>56 Kbps</td><td>500 Kbps or higher</td><td>2 Mbps or higher</td></tr>
<tr><td>Audio codec</td><td>AAC-LC</td><td>AAC-LC</td><td>AAC-LC</td></tr>
<tr><td>Audio channels</td><td>1 (mono)</td><td>2 (stereo)</td><td>2 (stereo)</td></tr>
<tr><td>Audio bitrate</td><td>24 Kbps</td><td>128 Kbps</td><td>192 Kbps</td></tr>
</table></td><td>On CDD-2.3.3, this content is not described</td></tr>
</table>

5. Multimedia Compatibility (3/4)

Chap.	Abstract	Topic
5.3 Audio Recording	• The device SHOULD exhibit approximately flat amplitude versus frequency characteristics; specifically, ±3 dB, from 100 Hz to 4000 Hz • Audio input sensitivity SHOULD be set such that a 90 dB sound power level (SPL) source at 1000 Hz yields RMS of 5000 for 16-bit samples. • PCM amplitude levels SHOULD linearly track input SPL changes over at least a 30 dB range from -18 dB to +12 dB re 90 dB SPL at the microphone. • Total harmonic distortion SHOULD be less than 1% from 100 Hz to 4000 Hz at 90 dB SPL input level • Noise reduction processing, if present, MUST be disabled. • Automatic gain control, if present, MUST be disabled..	while some of the requirements outlined above are stated as "SHOULD" for Android 4.0, the Compatibility Definition for a future version is planned to change these to "MUST". On CDD-2.3.3, the last 2 items are "SHOULD".

5. Multimedia Compatibility (4/4)

Chap.	Abstract	Topic
5.4 Audio Latency	• "cold output latency" is defined to be the interval between when an application requests audio playback and when sound begins playing, when the audio system has been idle and powered down prior to the request • "warm output latency" is defined to be the interval between when an application requests audio playback and when sound begins playing, when the audio system has been recently used but is currently idle (that is, silent) • "continuous output latency" is defined to be the interval between when an application issues a sample to be played and when the speaker physically plays the corresponding sound, while the device is currently playing back audio • "cold input latency" is defined to be the interval between when an application requests audio recording and when the first sample is delivered to the application via its callback, when the audio system and microphone has been idle and powered down prior to the request • "continuous input latency" is defined to be when an ambient sound occurs and when the sample corresponding to that sound is delivered to a recording application via its callback, while the device is in recording mode	while some of the requirements outlined above are stated as "SHOULD" for Android 4.0, the Compatibility Definition for a future version is planned to change these to "MUST".
5.5 Network Protocols	MUST support the following media network protocols: RTSP (RTP, SDP), HTTP(S) progressive streaming, HTTP(S) Live Streaming draft protocol, Version 3	

6章 Developer Tool Compatibility

Device implementations MUST support the Android Developer Tools provided in the Android SDK. Specifically, Android-compatible devices MUST be compatible with below:

Abstract	Topic
•adb (Android Debug Bridge) – MUST support all adb functions as documented in the Android SDK. – The device-side adb daemon MUST be inactive by default, and there MUST be a user-accessible mechanism to turn on	**If a device implementation is unrecognized by the adb tool as provided in the standard Android SDK, device implementers MUST provide Windows drivers allowing developers to connect to the device using the adb protocol. These drivers MUST be provided for Windows XP, Windows Vista, and Windows 7, in both 32-bit and 64-bit versions.**
•ddms (Dalvik Debug Monitor Service) – MUST support all ddms features as documented in the Android SDK. – As ddms uses adb, support for ddms SHOULD be inactive by default, but MUST be supported whenever the user has activated the ADB.	
•Monkey – MUST include the Monkey framework, and make it available for applications to use.	

7. Hardware Compatibility (1/7)

Chap.	Abstract	Topic
7. Hardware Compatibility	•If a device includes a particular hardware component, the device implementation MUST implement API as described in the Android SDK documentation. •If an API in the SDK interacts with a hardware component that is stated to be optional and the device implementation does not possess that component –complete class definitions (as documented by the SDK) for the component's APIs MUST still be present –the API's behaviors MUST be implemented as no-ops in some reasonable fashion –API methods MUST return null values where permitted by the SDK documentation –API methods MUST return no-op implementations of classes where null values are not permitted by the SDK documentation –API methods MUST NOT throw exceptions not documented by the SDK documentation •A typical example of a scenario where these requirements apply is the telephony API: even on non-phone devices, these APIs must be implemented as reasonable no-ops. •Device implementations MUST accurately report accurate hardware configuration information	

7. Hardware Compatibility (2/7)

Chap.	Abstract	Topic
7.1 Display and Graphics		On CDD-2.3.3, OpenGL ES 2.0 is “SHOULD”
Screen Configurations	•Device implementations MUST report the correct screen size as defined in the Android •SDK documentation [Resources, 38] •Devices MUST have screen sizes of at least 426 dp x 320 dp ('small') •'normal' MUST have screen sizes of at least 470 dp x 320 dp •'large' MUST have screen sizes of at least 640 dp x 480 dp •'xlarge' MUST have screen sizes of at least 960 dp x 720 dp •MUST have screen sizes of at least 2.5 inches in physical diagonal size •The aspect ratio MUST be between 1.3333 (4:3) and 1.85 (16:9) •MUST report one of the following logical Android framework densities –120 dpi, known as 'ldpi' –160 dpi, known as 'mdpi' –213 dpi, known as 'tvdpi' –240 dpi, known as 'hdpi' –320 dpi, known as 'xhdpi'	
Screen Orientation	MUST support dynamic orientation by applications to either portrait or landscape screen orientation	
2D and 3D Graphics Acceleration	MUST support OpenGL ES 1.0, OpenGL ES 2.0 MUST enable hardware acceleration by default	
Legacy Application Compatibility Mode	MUST include support for legacy application compatibility mode	
Screen Types	Fixed-Pixel for Mobile phone and Tablet, Variable-Pixel for TV and STB	
Screen Technology	MUST support displays capable of rendering 16-bit color graphics The display technology used MUST be comprised of square pixels	

7. Hardware Compatibility (3/7)

Chap.	Abstract	Topic
7.2 Input Devices		On CDD-2.3.3, Touchscreen input is "MUST"
Keyboard	describe about Keyboard	
Non-touch Navigation	•MAY omit a non-touch navigation option •MUST provide a reasonable alternative user interface mechanism for the selection and editing of text	
Navigation keys	The Home, Menu and Back functions are essential to the Android navigation paradigm. Device implementations MUST make these functions available to the user at all times when running applications.	
Touchscreen input	•MUST have a pointer input system of some kind (either mouse-like, or touch) •SHOULD support fully independently tracked pointers, if a touchscreen supports multiple pointers	
Microphone	MAY omit a microphone. However, if a device implementation omits a microphone, it MUST NOT report the android.hardware.microphone feature constant, and must implement the audio recording API as noops	

7. Hardware Compatibility (4/7)

Chap.	Abstract	Topic
7.3 Sensors	MAY omit these sensors. If a device includes a particular sensor type that has a corresponding API for third-party developers, the device implementation MUST implement that API as described in the Android SDK documentation	On CDD-2.2, some sensors (Accelerometer, Magnetometer, GPS) are “MUST”, but on CDD-2.3.3, those change to “SHOULD”.
Accelerometer	SHOULD include a 3-axis accelerometer	
Magnetometer	SHOULD include a 3-axis magnetometer (i.e. compass.)	
GPS	SHOULD include a GPS receiver	
Gyroscope	SHOULD include a gyroscope (i.e. angular change sensor.) Devices SHOULD NOT include a gyroscope sensor unless a 3-axis accelerometer is also included.	
Barometer	MAY include a barometer (i.e. ambient air pressure sensor.)	
Thermometer	MAY but SHOULD NOT include a thermometer (i.e. temperature sensor.) If a device implementation does include a thermometer, it MUST measure the temperature of the device CPU. It MUST NOT measure any other temperature.	
Photometer	MAY include a photometer (i.e. ambient light sensor.)	
Proximity Sensor	MAY include a proximity sensor.	

7. Hardware Compatibility (5/7)

Chap.	Abstract	Topic
7.4 Data Connectivity		On CDD-2.2, Wireless Connectivity (WiFi) is "MUST" On CDD-2.2, Bluetooth is "MUST"
Telephony	Android 4.0 MAY be used on devices that do not include telephony hardware. That is, Android 4.0 is compatible with devices that are not phones. However, if a device implementation does include GSM or CDMA telephony, it MUST implement full support for the API for that technology. Device implementations that do not include telephony hardware MUST implement the full APIs as no-ops.	
IEEE 802.11 (WiFi)	SHOULD include support for one or more forms of 802.11 (b/g/a/n, etc.)	
Bluetooth	SHOULD include a Bluetooth transceiver	
Near-Field Communications	SHOULD include a transceiver and related hardware for Near-Field Communications (NFC). If device has NFC, - MUST support SNEP 1.0 - MUST support Android Beam	
Minimum Network Capability	MUST include support for one or more forms of data networking Device implementations where a physical networking standard (such as Ethernet) is the primary data connection SHOULD also include support for at least one common wireless data standard, such as 802.11 (WiFi).	

7. Hardware Compatibility (6/7)

Chap.	Abstract	Topic
7.5 Cameras		On CDD-2.2, rear-facing Camera is “MUST”. On CDD-2.3.3, YV12 format is “SHOULD”
Rear-Facing Camera	SHOULD include a rear-facing camera If include, •MUST have a resolution of at least 2 megapixels •SHOULD have either hardware auto-focus, or software auto-focus	
Front-Facing Camera	MAY include a front-facing camera If include, •MUST have a resolution of at least VGA (that is, 640x480 pixels) •MUST NOT use a front-facing camera as the default for the Camera API	
Camera API Behavior	MUST implement the following behaviors for the camera-related APIs	

7. Hardware Compatibility (7/7)

Chap.	Abstract	Topic
7.6 Memory and Storage		
Minimum Memory and Storage	• MUST have at least 340MB of memory available to the kernel and userspace. (On CDD-2.3.3, 128MB) • The 340MB MUST be in addition to any memory. (On CDD-2.3.3, 128MB) • MUST have at least 350MB of non-volatile storage available for application private data. (On CDD-2.3.3, 150MB(MUST),1GB(SHOULD)) • MUST be capable of downloading individual files of at least 100MB in size to the default "cache" location. (On CDD-2.3.3, 55MB(MUST), 100MB(SHOULD))	
Application Shared Storage	• MUST offer shared storage for applications. (at least 1GB in size) • MUST mounted on the Linux path /sdcard, (symbolic link is OK) • If a device implementation includes an SD card slot to satisfy the shared storage requirement, a FAT-formatted SD card 1GB in size or larger MUST be included with the device as sold to users, and MUST be mounted by default. • MUST provide some mechanism to access the contents of shared storage from a host computer, such as USB mass storage (UMS) or Media Transfer Protocol (MTP).	
7.7 USB	SHOULD include a USB client port, and SHOULD include a USB host port. Actually, USB is "SHOULD". However, ADB is "MUST". So, if device doesn't have USB client port, it MUST support ADB via local-area network (E.G. Ethernet, 802.11)	On CDD-2.3.3, USB is "MUST"

8. Performance Compatibility

Device implementations MUST meet the key performance metrics of an Android 4.0 compatible device defined in the table below:

Abstract	Topic
•Application Launch Time – The following applications should – launch within the specified time. – Browser: less than 1300ms – Contacts: less than 700ms – Settings: less than 700ms •Simultaneous Applications – When multiple applications have been launched, re-launching an already running application after it has been launched must take less than the original launch time.	On CDD-2.3.3, MMS/SMS：less than 700ms Alarm Clock : less than 700ms

9. Security Model Compatibility

Device implementations MUST implement a security model consistent with the Android platform security model as defined in Security and Permissions reference document in the APIs

Chap.	Abstract	Topic
9.1	Permissions	CDD say “Don’t change the Android System for Permission and Security”, doesn’t it?
9.2	UID and Process Isolation	
9.3	Filesystem Permissions	
9.4	Alternate Execution Environments Device implementations MAY include runtime environments that execute applications using some other software or technology than the Dalvik virtual machine or native code. However, such alternate execution environments MUST NOT compromise the Android security model or the security of installed Android applications, as described in this section.	Do you want to change DalvikVM ? Maybe “No”

10. Software Compatibility Testing

- Device implementations MUST pass all tests described in this section.
- However, note that no software test package is fully comprehensive. For this reason, device implementers are very strongly encouraged to make the minimum number of changes as possible to the reference and preferred implementation of Android 4.0 available from the Android Open Source Project. This will minimize the risk of introducing bugs that create incompatibilities requiring rework and potential device updates.

Chap.	Abstract	Topic
10.1	Compatibility Test Suite MUST pass the Android Compatibility Test Suite (CTS)	Actually, CTS is one of the Compatibility Definitions
10.2	CTS Verifer MUST correctly execute all applicable cases in the CTS Verifier.	To check the action finally, CTS Verifer can check. It's a manual checking for some sensors and so on.
10.3	Reference Applications MUST test implementation compatibility using the following open source applications: •The "Apps for Android" applications [Resources, 55]. •Replica Island (available in Android Market)	What is the Compatibility Test? CDD doesn't say clearly…

11. Updatable Software

Describe the requirement for Update

Abstract	Topic
• MUST include a mechanism to replace the entirety of the system software. –Over-the-air (OTA) downloads with offline update via reboot –"Tethered" updates over USB from a host PC –"Offline" updates via a reboot and update from a file on removable storage • The update mechanism used MUST support updates without wiping user data. That is, the update mechanism MUST preserve application private data and application shared data.	On CDD 2.3.3, "That is, the update mechanism MUST preserve application private data and application shared data. " is not described

Appendix

- Appendix A - Bluetooth Test Procedure
  - CTS has the test for Bluetooth API, but Bluetooth is the network-protocol between two devices. So, the device implementer MUST pass the Manual test which is described on Appendix A.

How to Check ?

- I make some checking table and use them!
  - 01 : Code Diff table
  - 02 : Hardware checking list
  - 03 : Jar Package checking table
  - 04 : Value checking table
  - 05 : Intent checking table
  - 06 : Others (check by hand)

01 : Code Diff table (1/2)

- Pick up the difference API between my SRC and original Android SRC.
  - Input:
    - Original Android source code (Google releases)
    - My source code (developed source code)
  - Output:
    - Pick up “Added / Changed / Removed” of API implementation
    - Pick up “public / private /protected”

No	Package	Class and interface	API/Field	Type	Added/Changed/Removed	Public/Private/Protected/Defau
70	android.webkit	DatePicker	mMonthUpdateLock	Field	Added	Private
71	android.webkit	DatePicker	mMonthLocale	Field	Added	Private
72	android.webkit	DatePicker	mShortMonths	Field	Added	Private
73	android.webkit	DatePicker	DatePicker()	Method	Changed	Public
74	android.webkit	DatePicker	updateDate()	Method	Changed	Public
75	android.webkit	DatePicker	getShortMonths()	Method	Added	Private
76	android.webkit	TextView	mNoContextMenuOnUp	Field	Added	Private
77	android.webkit	TextView	onTapUpEvent()	Method	Changed	Private
78	android.webkit	TextView	onTouchEvent()	Method	Changed	Public
79	android.harware	Usb			Removed	Public
80	android.nfc	NfcSecureElement			Removed	Public
81	android.nfc	ApduList			Added	Public
82	android.harware.usb	UsbAccessory			Added	Public
83	android.harware.usb	UsbManager			Added	Public
84	android.net.wimax	WimaxManagerConstants			Added	Public
85	com.android.internal.app	ResolverActivity	onCreate()	Method	Changed	Protected
86	com.android.internal.app	ResolverActivity	onClick()	Method	Changed	Public
87	com.android.internal.app	ResolverActivity	onCreate()	Method	Added	Protected
88	com.android.internal.app	ResolverActivity	onIntentSelected()	Method	Added	Protected
89	com.android.internal.os	BatteryStatsImpl	VERSION	Field	Changed	Private
90	com.android.internal.os	BatteryStatsImpl	mDischargeScreenOnUnplugLevel	Field	Added	Private

01 : Code Diff tabel (2/2)

No	Package	Class and interface	API/Field	Type	Added/Changed/Removed	Public/Private/Protected/Default
70	android.webkit	DatePicker	mMonthUpdateLock	Field	Added	Private
71	android.webkit	DatePicker	mMonthLocale	Field	Added	Private
72	android.webkit	DatePicker	mShortMonths	Field	Added	Private
73	android.webkit	DatePicker	DatePicker()	Method	Changed	Public
74	android.webkit	DatePicker	updateDate()	Method	Changed	Public
75	android.webkit	DatePicker	getShortMonths()	Method	Added	Private
76	android.webkit	TextView	mNoContextMenuOnUp	Field	Added	Private
77	android.webkit	TextView	onTapUpEvent()	Method	Changed	Private
78	android.webkit	TextView	onTouchEvent()	Method	Changed	Public
79	android.harware	Usb			Removed	Public
80	android.nfc	NfcSecureElement			Removed	Public
81	android.nfc	ApduList			Added	Public
82	android.harware.usb	UsbAccessory			Added	Public
83	android.harware.usb	UsbManager			Added	Public
84	android.net.wimax	WimaxManagerConstants			Added	Public
85	com.android.internal.app	ResolverActivity	onCreate()	Method	Changed	Protected
86	com.android.internal.app	ResolverActivity	onClick()	Method	Changed	Public
87	com.android.internal.app	ResolverActivity	onCreate()	Method	Added	Protected
88	com.android.internal.app	ResolverActivity	onIntentSelected()	Method	Added	Protected
89	com.android.internal.os	BatteryStatsImpl	VERSION	Field	Changed	Private
90	com.android.internal.os	BatteryStatsImpl	mDischargeScreenOnUnplugLevel	Field	Added	Private

During development, I changed.

MUST NOT implement the new public method which is not described on Android SDK document
MUST NOT delete the public method which is described on Android SDK document

02 : Hardware checking list

- Hardware Compatibility（CDD Chap.7）
  - may - should - must

7.3.1. Accelerometer

Device implementations SHOULD include a 3-axis accelerometer. If a device implementation does include a 3-axis accelerometer, it:

- MUST be able to deliver events at 50 Hz or greater
- MUST comply with the Android sensor coordinate system as detailed in the Android APIs (see [Resources, 31])
- MUST be capable of measuring from freefall up to twice gravity (2g) or more on any three-dimensional vector
- MUST have 8-bits of accuracy or more
- MUST have a standard deviation no greater than 0.05 m/s^2

No	Device	Parameter of device	Condition (='Yes')	Status	Supported	
38	Barometer			MAY	Yes	
39	Barometer	Frequency (> 5Hz)	38	M	Yes	
40	Barometer	Adequate precision	38	M	Yes	
41	Thermometer			MAY	Yes	
42	Thermometer	Measuring the temperature of the device CPU	41	M	Yes	
43	Thermometer	Measuring the any other temperature	41	MN	No	
44	Photomerter		41	MAY	Yes	Ex: amb
45	Proximity sensor			MAY	No	
46	Proximity sensor	Measuring the proximity of an object in the same direction as the screen	45	M		
47	Proximity sensor	Oriented to detect objects close to the screen	45	M		
48	Proximity sensor	Accesible through the API if device implementation includes a proximity sensor with any other orientation	45	MN		
49	Proximity sensor	Accuracy (>1-bits)	45	M		
50	Telephony hardware (GSM)			MAY	Yes	

03 : Jar Package Checking table

- API Namespaces（CDD Chap.3.6）
  - MAY add custom APIs, but any such APIs MUST NOT be in a namespace owned by or referring to another organization.

  -> expand the Jar of normal library

  -> check the package name instead of java.*, android.*

No	Package	Class	Custom package
1	android	android.Manifest	No
2	android	android.R	No
3	android.accessibilityservice	accessibilityservice.AccessibilityService	No
4	android.accessibilityservice	accessibilityservice.AccessibilityServiceInfo	No
5	android.accounts	accounts.AbstractAccountAuthenticator	No
6	android.accounts	accounts.Account	No
7	android.accounts	accounts.AccountAuthenticatorActivity	No
8	android.accounts	accounts.AccountAuthenticatorResponse	No
9	android.accounts	accounts.AccountManager	No
10	android.accounts	accounts.AccountManagerCallback	No
11	android.accounts	accounts.AccountManagerFuture	No
12	android.accounts	accounts.AccountsException	No
13	android.accounts	accounts.AuthenticatorDescription	No
14	android.accounts	accounts.AuthenticatorException	No
15	android.accounts	accounts.NetworkErrorException	No
16	android.accounts	accounts.OnAccountsUpdateListener	No
17	android.accounts	accounts.OperationCanceledException	No
18	com.panasonic	app.Activity	Yes
19	android.app	app.ActivityGroup	No
20	android.app	app.ActivityManager	No
21	android.app	app.AlarmManager	No
22	android.app	app.AlertDialog	No
23	android.app	app.AliasActivity	No

04 : Value Checking table

- Gather the Parameters which CDD describes
  - "Device implementations MUST report correct values for…"
- Get the Value from source code (and adb command)
- Can check the value on the table

No.	Parameter	Description of parameter	Value extracted from implementation	Same as product specification	Reference
16	android.os.Build.CPU_ABI	The name of the instruction set (CPU type + ABI convention) of native code. Warning: The value of the parameter must be one of supported ABI in the CPU-ARCH-ABIS.html file. Please refer the supported ABI which is listed in List_supported_ABI.xls file.	armeabi		http://developer.android.com/reference/android/os/Build.html
18	android.util.DisplayMetrics.density	The logical density of the display. This is a scaling factor for the Density Independent Pixel unit, where one DIP is one pixel on an approximately 160 dpi screen (for example a 240x320, 1.5"x2" screen), providing the baseline of the system's display. Thus on a 160dpi screen this density value will be 1; on a 120 dpi screen it would be .75; etc.	1.0		http://developer.android.com/reference/android/util/DisplayMetrics.html
19	android.util.DisplayMetrics.densityDpi	The screen density expressed as dots-per-inch. May be either DENSITY_LOW, DENSITY_MEDIUM, or DENSITY_HIGH.	160		http://developer.android.com/reference/android/util/DisplayMetrics.html
	android.util.DisplayMetrics.heightPix	The absolute height of the display in			http://developer.android.com/r

05 : Intent Checking table

- Intent Compatibility (CDD Chap.3.2.3)
  - To exchange the Core application is OK
  - However, they MUST support all Intent

Pick Up the all Intent which the each Core Application support
Check the non-support Intent

Application	Activity/Service	Intent Filter	
		Action	
QuickSearchBox	.SearchActivity	android.search.action.GLOBAL_SEARCH	android.intent.category.DEFAULT
QuickSearchBox	.SearchActivity	android.search.action.GLOBAL_SEARCH	android.intent.category.DEFAULT
QuickSearchBox	.SearchActivity	com.android.quicksearchbox.action.QSB_AND_SELECT_	android.intent.category.DEFAULT
QuickSearchBox	.SearchActivity	com.android.quicksearchbox.action.QSB_AND_SELECT_	android.intent.category.DEFAULT
QuickSearchBox	.SearchSettings	android.intent.action.MAIN	
QuickSearchBox	.SearchSettings	android.search.action.SEARCH_SETTINGS	android.intent.category.DEFAULT
QuickSearchBox	.SearchableItemsSettings	com.android.quicksearchbox.action.SEARCHABLE_ITEMS	android.intent.category.DEFAULT
QuickSearchBox	.SearchWidgetConfigActivity	android.appwidget.action.APPWIDGET_CONFIGURE	
QuickSearchBox	.google.GoogleSearch	android.intent.action.WEB_SEARCH	android.intent.category.DEFAULT
QuickSearchBox	.google.GoogleSearch	android.intent.action.MAIN	android.intent.category.MONKEY
QuickSearchBox	.google.GoogleSettings	android.search.action.WEB_SEARCH_SETTINGS	android.intent.category.DEFAULT
Settings	Settings	android.intent.action.MAIN	android.intent.category.DEFAULT android.intent.category.LAUNC
Settings	CreateShortcut	android.intent.action.CREATE_SHORTCUT	android.intent.category.DEFAULT
Settings	WirelessSettings	android.intent.action.MAIN	android.intent.category.DEFAULT android.intent.category.VOICE_
Settings	.wimax.WimaxSettings	android.intent.action.MAIN	android.intent.category.DEFAULT android.intent.category.VOICE_
Settings	.wifi.WifiSettings	android.intent.action.MAIN	android.intent.category.DEFAULT android.intent.category.VOICE_
Settings	.wifi.AdvancedSettings	android.intent.action.MAIN	android.intent.category.VOICE_LAUNCH android.intent.category.D

06 : Others (check by hand)

- There are some checking point by hand
- Make table for each
  - adb, monkey, ddms, Driver, Media Encorder

Thanks !

Questions ?