Oculus Mobile Software Development Kit (SDK) Device and Environment Setup Guide

v. 0.4

I. Introduction

Welcome to the Oculus VR Mobile Software Development Kit! This SDK will demonstrate how to implement high-performance, high-quality and fully-immersive Virtual Reality applications for Samsung Gear VR..

If you are new to the SDK, this document contains all of the information you need to get started.

If you have already created a project with a previous version of the SDK, please see the document titled *SDK Migration Guide* for additional information specific to project migration.

Application signing is a necessary aspect of fully realizing VR development with our SDK. Please be sure to read the "Initial SDK Setup" section beginning on page XXXX below, which covers this important topic in this document.

Questions?

Visit our developer support forums at https://developer.oculus.com.

Our Support Center can be accessed at https://support.oculus.com.

I.1 System and Hardware Requirements

Please begin by making sure that you are using supported hardware and devices for this release of the Oculus Mobile SDK v1.0.0.

Operating System Requirements

The Oculus Mobile SDK currently supports Windows 7, Mac OS X and Linux.

Minimum System Requirements

The following computer system requirements for the Oculus Mobile SDK are based on the Android SDK system requirements:

- Windows: 7
- Mac OS: 10.6+ (x86 only)
- Linux: Ubuntu 12.04 LTS
  - GNU C Library (glibc) 2.7 or later is required
  - 64-bit distributions capable of running 32-bit applications
- 2.0+ GHz processor
- 2 GB system RAM

Supported Devices

- Samsung Note 4
- Samsung Gear VR

Target Device Requirements

- API level
  - 19 (Android 4.4.2)
- VR Hardware
  - See “Supported Devices” above.
  - 3.0 Class 2 Bluetooth gamepad (see below)

Bluetooth Gamepad

A Bluetooth gamepad (3.0 Class 2) is necessary for testing the sample applications which come with this release. You may use the Samsung El-GP20 gamepad or a Moga Pro.

For more information about the Samsung El-GP20, including specifications and key bindings, see the following: http://developer.samsung.com/s-console.

Bluetooth Keyboard

It is useful (but not required) to have a Bluetooth keyboard during development. The Logitech K810 is known to function well.

Note: Please refer to your device product manual for additional information.

I.2 Getting Started

To become acquainted with the Oculus Home VR environment and with using Gear VR, we suggest starting with the *Samsung SM-R320 User Manual* and *Gamepad User Manual* (bundled with the device contents).

To dive into the SDK set up and configure your development environment, refer to *Section III. Device Setup* and *Section IV. Android Development Environment Setup* in this guide.

Once your development environment and devices are set up, we recommend reviewing the following directories of the SDK documentation. There you will find some basic guidelines and recommendations for design and implementation. The key is to be innovative without sacrificing performance, and to be conservative from the start.

- Guidelines and Performance
- Asset Creation

You can also find Gear VR submission information and other helpful documents at https://developer.oculus.com/.

Ready to start developing?

If you are primarily interested in developing a Native Mobile VR Application, start with the Native SDK Overview, in the Native folder.

If you are primarily interested in developing a Unity Mobile VR Application, start with the Integration Guide and Unity Performance Best Practices documents in the Unity folder.

For both Native and Unity development, we also recommend:

- Android Debugging in the Android folder
- Performance Analysis and Performance Guidelines documents in the Performance folder
- The various documents in the *Technical Notes* folder.

Thank you for joining us at the forefront of Virtual Reality!

II. SDK Overview

II.1 Initial SDK Setup

II.1.1 Install the SDK

The mobile SDK is composed of a compressed archive in .zip format which contains both source and media files: ovr_mobile_sdk_yyyymmdd.zip.

Once downloaded, extract the .zip file into a directory of your choice (e.g., C:\Oculus\Mobile).

II.1.2 What's Included

Included with this SDK, you will find the following:

- VrLib, the native framework for building high-performance VR Applications.
- Unity Standalone Integration for adding the VR framework to your Unity project.
- Example Native and Unity Projects with source to provide a basis for creating your own VR applications.
- Several pre-built sample applications, some implemented in native and some in Unity.

Application	Unity / Native	Description
Oculus 360 Photos	**Native**	A viewer for panoramic stills.
Oculus 360 Videos	**Native**	A viewer for panoramic videos.

Oculus Cinema	**Native**	Plays 2D & 3D movies in a virtual movie theatre.
VrScene	**Native**	Loads a scene which can be navigated using a gamepad.
BlockSplosion	**Unity**	A simple game example in which blocks can be thrown to knock over structures and collect stars.
Shadowgun **by Madfinger Games**	**Unity**	An example app that renders a scene and character from Shadowgun by Madfinger Games.

Note: The sample applications included with the SDK are provided as a convenience for development purposes. Some of these apps also have similar versions downloadable from our app store. Due to the potential for conflict with these versions, we do not recommend running these sample apps on the same device on which you have installed your retail Gear VR Innovator experience. Please take care to secure the retail media content bundled with the SM-R320. It will be difficult if not impossible to replace.

For the Mobile SDK, we have limited pre-loaded media. Please add your own media by consulting the following table and media creation guidelines for compatibility:

Application	**Path for Media on the SD Card**
Oculus Cinema - 2D Movie	Movies\ DCIM\ Oculus\Movies\My Videos
Oculus Cinema - 3D Movie	Movies\3D DCIM\3D Oculus\Movies\My Videos\3D

Oculus 360 Video - 360 degree Panoramic video	Oculus\360Videos
Oculus 360 Photo (360 degree static photos) *Note: non-360 degree photos will not render properly.*	Oculus\360Photos

II.1.3 What You Need To Run Your Own App - Oculus Signature file

Application signing is an important step in this process. In order to access the full functionality of the VR APIs, your app will require a temporary Oculus Signature file (osig).

When your app is ready for publication we will take care of this signing process for you. However, in order to test your app prior to store submission, you will need to generate a temporary developer signature file that is unique to your device. **Please note that your app will not run properly unless it is built with the inclusion of this signature file.**

Always check our developer portal for the latest developments regarding app submission and guidelines at https://developer.oculus.com. We will continue to streamline this process to help simplify development with our SDK.

(1) Locate your device ID. Note that the device ID is not the phone's serial number. To retrieve your phone's device ID, connect to your device via USB, open an OS shell or command window, and enter:

```
adb devices
```

You should see a list of attached devices like this:

```
List of devices attached
ce0551e7 device
```

In this example, the device ID is **ce0551e7**.

For more information on Android debugging tools and *adb* including troubleshooting, see *Android Debugging* in the mobile SDK documents.

(2) Email the device ID to devicesigning@oculus.com.

(3) We will respond with a signature file (named “oculussig_{device id}”). You must embed this file in your application binary.

- For native apps, place the generated signature file in: Project/assets/
- For Unity apps, place the signature file in: Project/Assets/Plugins/Android/assets/

(4) Rebuild your application. It will now run on your device and fully access VR functionality.

Note that you may include multiple signature files in a single application in order to support multiple devices within your organization. When submitting builds for publication, please ensure that these signature files have been removed.

III. Device Setup

This section will provide information on how to setup your supported device and gamepad for running, debugging, and testing your Gear VR application.

Please review the Supported Devices above for the list of supported devices for this SDK release.

Note: This information is accurate at the time of publication of this document. Unfortunately, we cannot guarantee the consistency or reliability of any of the third-party applications discussed in these pages, nor can we offer support for any of the third-party applications we describe.

III.1 Setting up your System to Detect your Android Device

To run, debug, and test your application on an Android device, you must set up your system to detect your Android device over USB. If the device is not automatically detected by your system when connected over USB, update the drivers manually. More information can be found in the “Using Hardware Devices” section at http://developer.android.com/tools/device.html.

Windows

If you are developing on Windows, you need to install a USB driver for adb. For an installation guide and links to OEM drivers, see the OEM USB Drivers document.

Samsung Android drivers may be found on their developer site:
http://developer.samsung.com/android/tools-sdks/Samsung-Android-USB-Driver-for-Windows

Windows may automatically detect the correct device and install the appropriate drivers when you connect your device to a USB port on your computer. However, if Windows is unable to detect your device, you may still need to update the drivers through the Windows Device Manager, even if your device was automatically detected.

Access the Device Manager through the Windows Control Panel. If the device was automatically detected, it will show up under *Portable Devices* in the Device Manager. Otherwise, look under *Other Devices* in the Device Manager and select the device to manually update the driver.

To verify that the driver successfully recognized the device, open a command prompt and type the command:

```
adb devices
```

Note: You will need to successfully setup your Android development environment in order to use this command. See the next section: Android Development Environment Setup

If the device does not show up, verify that the device is turned on with enough battery power, and that the driver is installed properly.

Mac OS

If you're developing on Mac OS X, you do not need to install USB drivers. Your Samsung device may display a notification recommending you install Android File Transfer. A handy application for transferring files between OS X and Android.

Linux

If you're developing on Ubuntu Linux, you need to add a `udev` rules file that contains a USB configuration for each type of device you want to use for development. In the rules file, each device manufacturer is identified by a unique vendor ID, as specified by the `ATTR{idVendor}` property. For a list of vendor IDs, see USB Vendor IDs. To set up device detection on Ubuntu Linux:

1. Log in as root and create this file: /etc/udev/rules.d/51-android.rules.
2. Use this format to add each vendor to the file:

```
SUBSYSTEM=="usb", ATTR{idVendor}=="04e8", MODE="0666", GROUP="plugdev"
```

3. Now execute: `chmod a+r /etc/udev/rules.d/51-android.rules`

In this example, the vendor ID is for Samsung. The MODE assignment specifies read/write permissions, and GROUP defines which Unix group owns the device node.

Note: The rule syntax may vary slightly depending on your environment. Consult the udev documentation for your system as needed. For an overview of rule syntax, see this guide to writing udev rules.

III.2 Configuring your Android Device for Debugging

In order to test and debug applications on your Android device, you will need to enable specific developer options on the device.

III.2.1 Note 4 Developer Options

Developer options may be found under:
Home -> *All Apps* -> *Settings* -> *System* -> *Developer options*

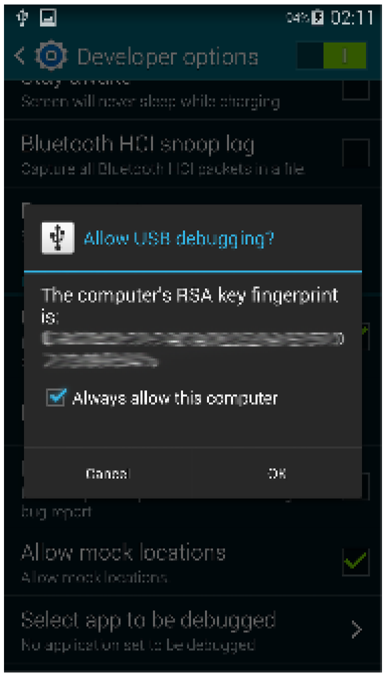
Developer options may be hidden by default. If so, you can expose these options with the following steps:

1. Go to *Home* -> *All Apps* -> *Settings* -> *System* -> *About device*.
2. Scroll down to *Build number*.
3. Press *Build number* 7 times.

You should be informed that *Developer options* has been enabled.

Once you have found *Developer options*, enable the following:

USB Debugging: This will allow the tools to install and launch deployed apps over USB.


Developer options
Screen will never sleep while charging
Bluetooth HCI snoop log
Capture all Bluetooth HCI packets in a file
Allow USB debugging?
The computer's RSA key fingerprint is:
[redacted]
Always allow this computer ✓
Cancel
OK
bug report
Allow mock locations ✓
Allow mock locations
Select app to be debugged
No application set to be debugged

[Samsung Galaxy S5]

You should see the screen shown on the left.

***Note**: If the above screen does not appear, ensure that your system recognizes the device and toggle "USB Debugging" off then back on.*

Check *Always allow this computer* and hit *OK*.

To purge the authorized whitelist for USB Debugging, press *Revoke USB debugging authorizations* from the *Developer options* menu and press *OK*.

Allow mock locations: This will allow you to send mock location information to the device (convenient for apps which use Location Based Services).

Verify apps via USB: This will check installed apps from ADB/ADT for harmful behavior.

III.2.2 Display Options

The following display options are found in:
Home -> *Apps* -> *Settings* -> *Sound and Display*

Lock screen/Screen Security/Screen lock: When set to *None* the Home screen is instantly available, without swipe or password. Useful to quickly get in and out of the phone.

Display/Screen timeout: Set the time to your desired duration. Useful if you are not actively accessing the device but wish to keep the screen awake longer than the default 30 seconds.

See *Android Debugging* for more information.

IV. Android Development Environment Setup

This section describes setup and configuration of the Android Development Environment necessary for building Oculus Android mobile applications.

Note: this section describes installation and configuration of third-party systems that are undergoing development. Whenever possible, we strongly recommend installing only the versions specified or recommended by the documentation, as unanticipated changes may break compatibility.

IV.1 Android Development Software Setup for Windows

In order to develop Android applications, you must have the following software installed on your system:

1. Java Development Kit (JDK)
2. Android Development Tools (ADT) Bundle
3. Android NDK
4. Apache Ant

IV.1.1 Java Development Kit

The Java Development Kit (JDK) is a prerequisite for the Android Eclipse IDE (which comes with the ADT Bundle) as well as Apache Ant.

The latest version which has been tested with this release is JDK 8u11. You may download the appropriate version for your OS from the following location:
http://www.oracle.com/technetwork/java/javase/downloads/jdk8-downloads-2133151.html

Note: As of October 2014, the Windows x86 version of the JDK appears to be incompatible with Eclipse and cannot be used.

Once downloaded and installed, add the environment variable JAVA_HOME, which should be set to the JDK install location, e.g.:
C:\Program Files\Java\jdk1.8.0_11 if you have installed the x64 version or
C:\Program Files (x86)\Java\jdk1.8.0_11 if you have installed the x86 version.

Make sure your JAVA_HOME variable does not include quotation marks. If you use `set` from the command line, the correct syntax is:

```
set JAVA_HOME=C:\Program Files (x86)\Java\jdk1.8.0_11
```

Do not use quotes with the 'set' command, even though the path has a space in it. Also, please *verify your installation path* - this example is based on the default installation of Java SE 8u11.

IV.1.2 Android Development Tools Bundle

The Android Development Tools (ADT) Bundle includes everything needed to begin developing Java Android Apps:

- Android SDK Tools
- Android Platform Tools
- Latest Android Platform
- Eclipse with integrated ADT Plugin
- Latest System Image for Emulator

The ADT bundle comes in either a 32-bit or 64-bit version. This must match the JDK option you selected above. The latest version of the ADT Bundle is available for download at the following location:
http://developer.android.com/sdk/index.html#download

Once downloaded, unpack the zip file and save to your Android development folder, e.g.:
C:\Dev\Android\adt-bundle-<os_platform>\

Add the ADT SDK tools and platform-tools to your PATH, e.g.:
C:\Dev\Android\android_adt_bundle_20140702\sdk\tools
C:\Dev\Android\android_adt_bundle_20140702\sdk\platform-tools

Add the environment variable ANDROID_HOME which should be set to your Android SDK location, e.g.:
C:\Dev\Android\android_adt_bundle_20140702\sdk

```
set
ANDROID_HOME=C:\Dev\Android\adt-bundle-windows-x86-20140702\sdk
```

IV.1.3 Installing Additional Packages and Tools

The Android SDK does not include everything you will need for development by default. You will need to download additional packages via the SDK Manager before you begin.

Note: Before launching the SDK Manager, make sure you have installed the JDK as outlined in Section IV.1.1 of this document. SDK Manager may fail to launch if it has not been installed.

1. Launch the Android SDK Manager located at:
C:/Dev/Android/adt-bundle-<os_platform>/SDKManager.exe

You may also launch it via Eclipse by selecting the SDK Manager in the toolbar.

2. Under the *Tools* section within *Packages*, select the following (if they are unselected):

Android SDK Tools	Rev. 23.0.5
Android SDK Platform-tools	Rev. 21
Android SDK Build-tools	Rev. 20

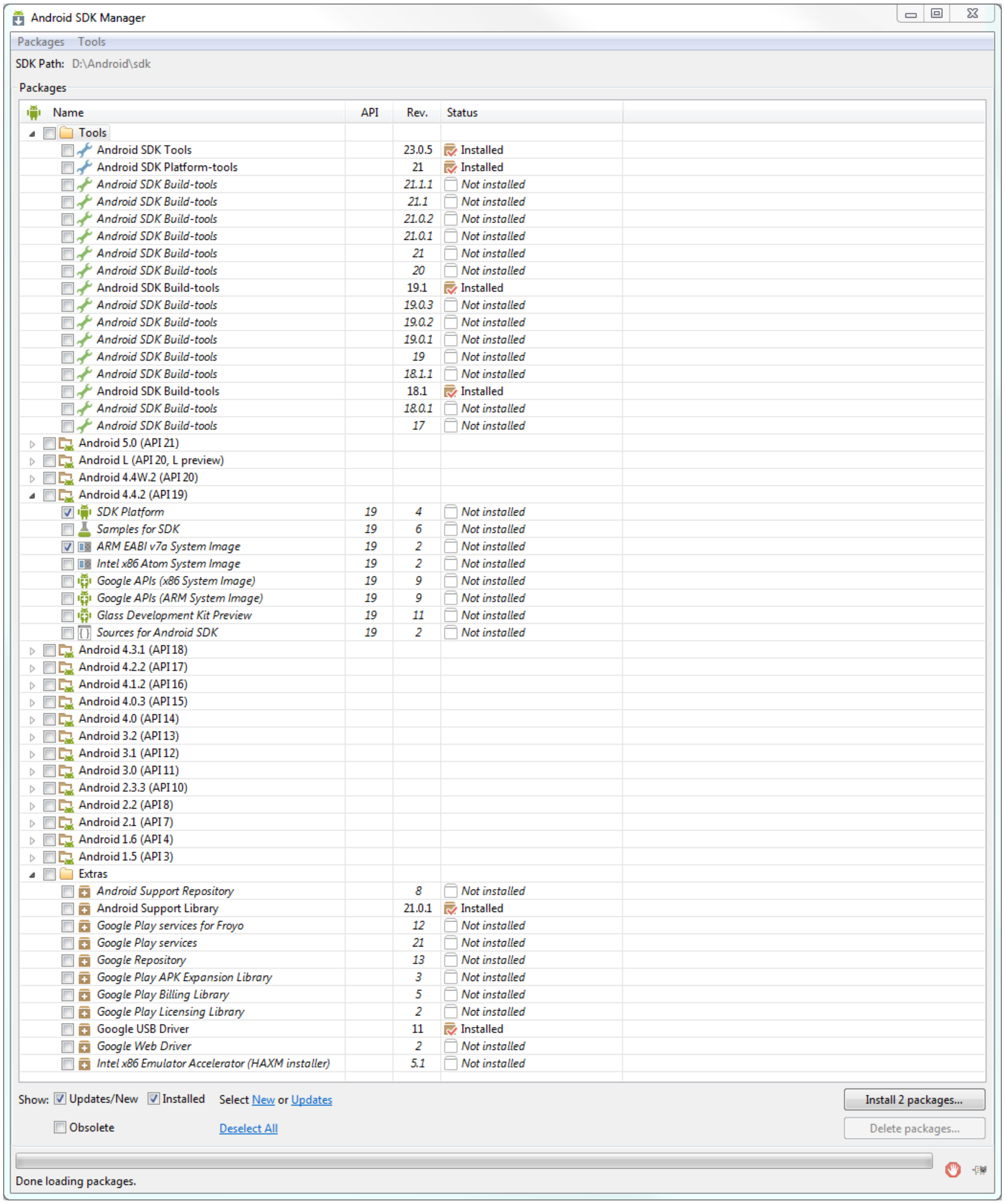
3. Our current Android build target is Android 4.4.2 (API 19). Select at least the following under the API 19 section:

SDK Platform
ARM EABI v7a System Image

Additionally, you may also wish to install *Sources for Android SDK*, which is invaluable for dealing with the Android API.

4. Finally, under *Extras* at the bottom, select the following:

Android Support Library	Rev. 21.0.1
Google USB Driver	Rev. 11



Android SDK Manager

Packages Tools

SDK Path: D:\Android\sdk

Packages

Name	API	Rev.	Status
☐ Tools			
☐ Android SDK Tools		23.0.5	Installed
☐ Android SDK Platform-tools		21	Installed
☐ Android SDK Build-tools		21.1.1	Not installed
☐ Android SDK Build-tools		21.1	Not installed
☐ Android SDK Build-tools		21.0.2	Not installed
☐ Android SDK Build-tools		21.0.1	Not installed
☐ Android SDK Build-tools		21	Not installed
☐ Android SDK Build-tools		20	Not installed
☐ Android SDK Build-tools		19.1	Installed
☐ Android SDK Build-tools		19.0.3	Not installed
☐ Android SDK Build-tools		19.0.2	Not installed
☐ Android SDK Build-tools		19.0.1	Not installed
☐ Android SDK Build-tools		19	Not installed
☐ Android SDK Build-tools		18.1.1	Not installed
☐ Android SDK Build-tools		18.1	Installed
☐ Android SDK Build-tools		18.0.1	Not installed
☐ Android SDK Build-tools		17	Not installed
☐ Android 5.0 (API 21)			
☐ Android L (API 20, L preview)			
☐ Android 4.4W.2 (API 20)			
☐ Android 4.4.2 (API 19)			
☑ SDK Platform	19	4	Not installed
☐ Samples for SDK	19	6	Not installed
☑ ARM EABI v7a System Image	19	2	Not installed
☐ Intel x86 Atom System Image	19	2	Not installed
☐ Google APIs (x86 System Image)	19	9	Not installed
☐ Google APIs (ARM System Image)	19	9	Not installed
☐ Glass Development Kit Preview	19	11	Not installed
☐ Sources for Android SDK	19	2	Not installed
☐ Android 4.3.1 (API 18)			
☐ Android 4.2.2 (API 17)			
☐ Android 4.1.2 (API 16)			
☐ Android 4.0.3 (API 15)			
☐ Android 4.0 (API 14)			
☐ Android 3.2 (API 13)			
☐ Android 3.1 (API 12)			
☐ Android 3.0 (API 11)			
☐ Android 2.3.3 (API 10)			
☐ Android 2.2 (API 8)			
☐ Android 2.1 (API 7)			
☐ Android 1.6 (API 4)			
☐ Android 1.5 (API 3)			
☐ Extras			
☐ Android Support Repository		8	Not installed
☐ Android Support Library		21.0.1	Installed
☐ Google Play services for Froyo		12	Not installed
☐ Google Play services		21	Not installed
☐ Google Repository		13	Not installed
☐ Google Play APK Expansion Library		3	Not installed
☐ Google Play Billing Library		5	Not installed
☐ Google Play Licensing Library		2	Not installed
☐ Google USB Driver		11	Installed
☐ Google Web Driver		2	Not installed
☐ Intel x86 Emulator Accelerator (HAXM installer)		5.1	Not installed

Show: ☑ Updates/New ☑ Installed Select New or Updates Install 2 packages...

☐ Obsolete Deselect All Delete packages...

Done loading packages.

5. Open *Android 4.4.2 (API 19)* and select the items for *SDK Platform* and *ARM EABI v7a System Image*. Note that Oculus Mobile SDK projects use API level 19.

6. Click *Install* X *Packages*, where *X* is the number of selected packages (it may vary based on what needs to be updated).

7. On the next dialog, choose *Accept License*.

8. Click *Install* to install and update packages.

You may install additional packages above API 19 if you wish. Android SDK Tools 23.0.2, Android SDK Platform-tools 20 and Android SDK Build-tools 20 have all been verified to work correctly with the SDK.

If you have problems compiling after an update, close the Android SDK Manager and re-open it to make sure you have everything required for the installed packages. In some cases you may get the warning “Could not load definitions from resource emma_ant.properties”. This is usually due to missing components in the install or improper file permissions. If the problem persists after verifying everything is up to date, try deleting the local.properties files from your project folders and updating them in each project folder with the command:

```
android update project -p .
```

and then rebuild.

IV.1.4 Verify Eclipse Configuration

You should verify that Eclipse has the proper location for your Android Development Tools.

Launch the Eclipse executable which came with the ADT bundle, e.g.:
C:\Dev\Android\android_adt_bundle_20140702\eclipse\eclipse.exe.

1. In the Eclipse menu go to *Window* -> *Preferences* -> *Android*

2. The Android Preferences *SDK Location* should be set to the location where you installed the ADT bundle SDK in the previous section, e.g.:
C:\Dev\Android\android_adt_bundle_20140702\sdk.

IV.1.5 Android Native Development Kit

The Android Native Development Kit (NDK) is a toolset that allows you to implement parts of your app using native-code languages such as C and C++. It is used extensively by the sample applications which come with this release.

The latest version of NDK is available for download at the following location:
https://developer.android.com/tools/sdk/ndk/index.html

Once downloaded, install NDK to your Android development folder, e.g.:
C:\Dev\Android\android-ndk-r10c\.

Add the NDK location to your PATH, e.g.:
C:\Dev\Android\android-ndk-r10c\.

Add the environment variable ANDROID_NDK which should be set to your Android NDK location, e.g.:
C:\Dev\Android\android-ndk-r10c.

```
set ANDROID_NDK=C:\Dev\Android\android-ndk-r10c
```

Configure Eclipse for NDK Usage

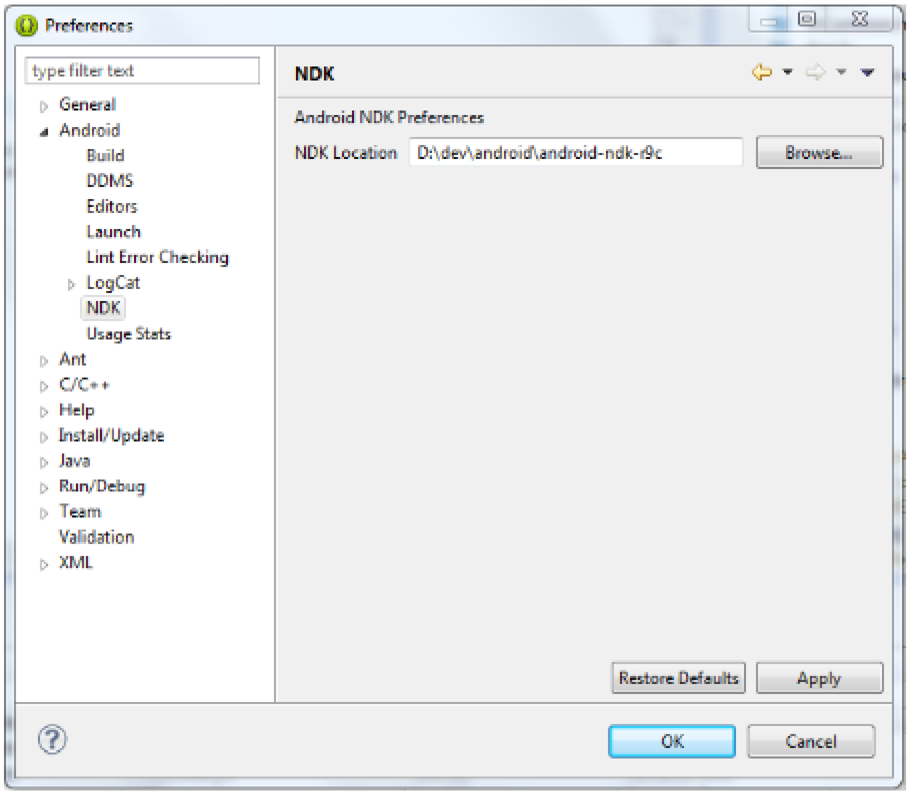
1. Start Eclipse from the location it was installed to, e.g.:
C:\Dev\Android\adt-bundle-windows-x86_64-20140702\eclipse\eclipse.exe.

2. Download and install the Eclipse ADT Plugin.
   (a) In the Eclipse menu go to: *Help -> Install New Software*.
   (b) Click *Add* in the top-right corner.
   (c) In the Add Repository dialog that appears, enter “ADT Plugin” for the *Name* and the following URL:

```
https://dl-ssl.google.com/android/eclipse
```

   (d) Click *OK*.
   (e) In the *Available Software* dialog, select the checkbox for *Developer Tools* and click *Next*.
   (f) Click *OK*.
   (g) In the next window, you’ll see a list of tools to be download. Click *Next*.
   (h) Read and accept the license agreements, then click *Finish*. Click *OK* if you get any prompts regarding the security and authenticity of the software.
   (i) When the installation completes, restart Eclipse.

3. Configure the NDK path:
   (a) In the Eclipse menu go to: *Window -> Preferences -> Android*.
   (b) Under *Android* select *NDK*.
   (c) Set the *NDK Location* field to the directory where the NDK is installed.



Android NDK Preferences

NDK Location: D:\dev\android\android-ndk-r9c

[Android NDK]

If the *NDK* option under the Android section is missing, something went wrong with the Eclipse ADT Plugin installation. Full instructions and troubleshooting information may be found here:
http://developer.android.com/sdk/installing/installing-adt.html#Troubleshooting

IV.1.6 Apache Ant

Apache Ant is a Java library and command-line build system. It provides a number of built-in tasks which simplify building Java projects. The Apache Ant project is part of the Apache Software Foundation.

The latest version which has been tested with this release is Apache Ant 1.9.3 and is available for download at the following location:
http://ant.apache.org/bindownload.cgi

Note: The Ant download page is very explicit about verifying the Ant binary, but this is not strictly necessary to use Ant or to get Android development up and running.

Once downloaded, unpack the zip file and save to your Android development folder, e.g.: C:/Dev/Android/apache-ant-1.9.3.

Next, add the Ant bin folder to your PATH, e.g.:
C:\Dev\Android\apache-ant-1.9.3\bin.

For more information on using Ant to automate building Android Apps, see:
http://www.androidengineer.com/2010/06/using-ant-to-automate-building-android.html

IV.2 Android Development Software Setup for OS X

IV.2.1 Xcode

Before installing any Android development tools, you must install Xcode. Once Xcode is installed, some of the following steps (such as installing Apache Ant or the JDK) may be unnecessary - some versions of OS X (10.5 and higher) include Apache Ant, and some do not. On Mavericks 10.9, Ant does not appear to be installed by default or included with Xcode 5.0.2.

IV.2.2 Java Development Kit

The Java Development Kit (JDK 8) is a prerequisite for the Android Eclipse IDE (included with the ADT Bundle) as well as Apache Ant.

Install the JDK if it is not already present on your system. If you already installed Xcode, this step may be unnecessary.

The latest version tested with this release is JDK 8 - it may be downloaded at the following location:
http://www.oracle.com/technetwork/java/javase/downloads/jdk8-downloads-2133151.html

IV.2.3 Android Development Tools Bundle

The Android Development Tools ADT Bundle includes almost everything needed to begin developing Android Apps:

- Android SDK Tools
- Android Platform Tools
- Latest Android Platform
- Eclipse with integrated ADT Plugin
- Latest System Image for Emulator

The latest version of the ADT is available for download at the following location:
http://developer.android.com/sdk/index.html#download

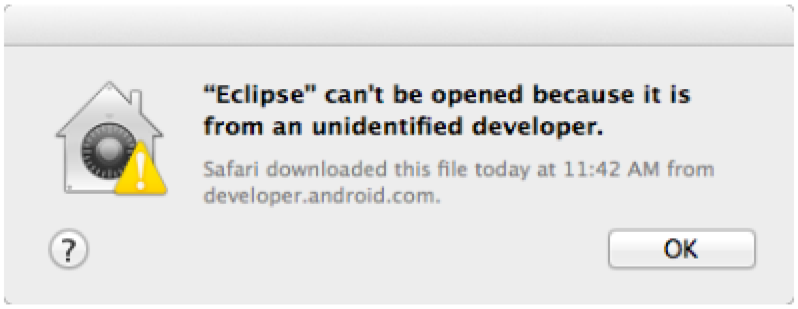
The architecture selected for the JDK above must be the same as the ADT (i.e., both must be either 32-bit or 64-bit).

Note: The tilde character followed by a forward slash (~/) is shorthand for the current user's home folder. It is used throughout this section.

In your home folder, create a new folder named "dev". To get to home folder in OS X, open Finder and press CMD+Shift+H.

Once downloaded, unzip the ADT archive (if necessary) and save to your "dev" folder.

Browse to ~/dev/adt-bundle-<version>/eclipse and double-click the Eclipse icon. You may receive a warning like the following:



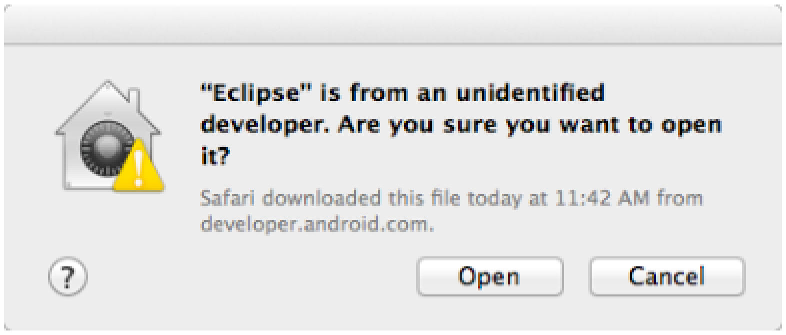
"Eclipse" can't be opened because it is from an unidentified developer.

Safari downloaded this file today at 11:42 AM from developer.android.com.

[Apple Safari]

Note: Please refer to Apple's knowledge base regarding this security feature and safeguards for apps downloaded and installed from the internet.

To remedy this, right click the Eclipse icon and choose *Open*. You will get a warning again, but it will now present an *Open* option:

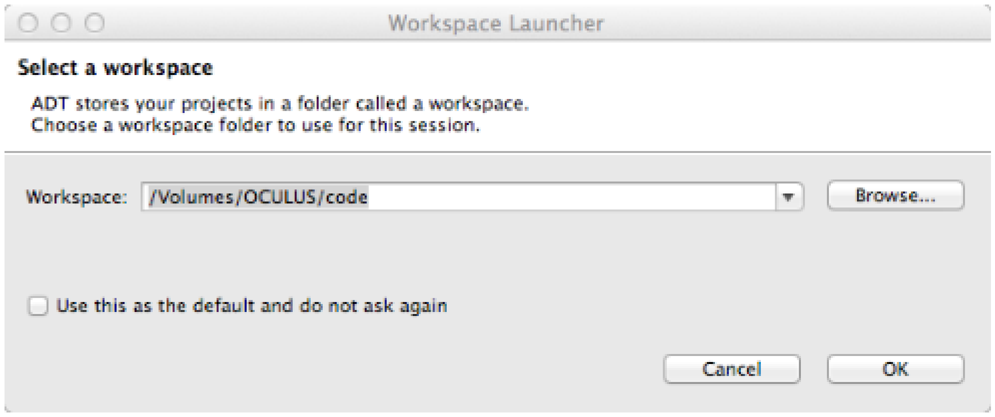


"Eclipse" is from an unidentified developer. Are you sure you want to open it?

Safari downloaded this file today at 11:42 AM from developer.android.com.

[Apple Safari]

Select *Open* to start Eclipse. If you get a message that Eclipse needs JRE 6 in order to run, allow it to download and install JRE 6. Next, you should see a window asking you to select your workspace:



Workspace Launcher

Select a workspace

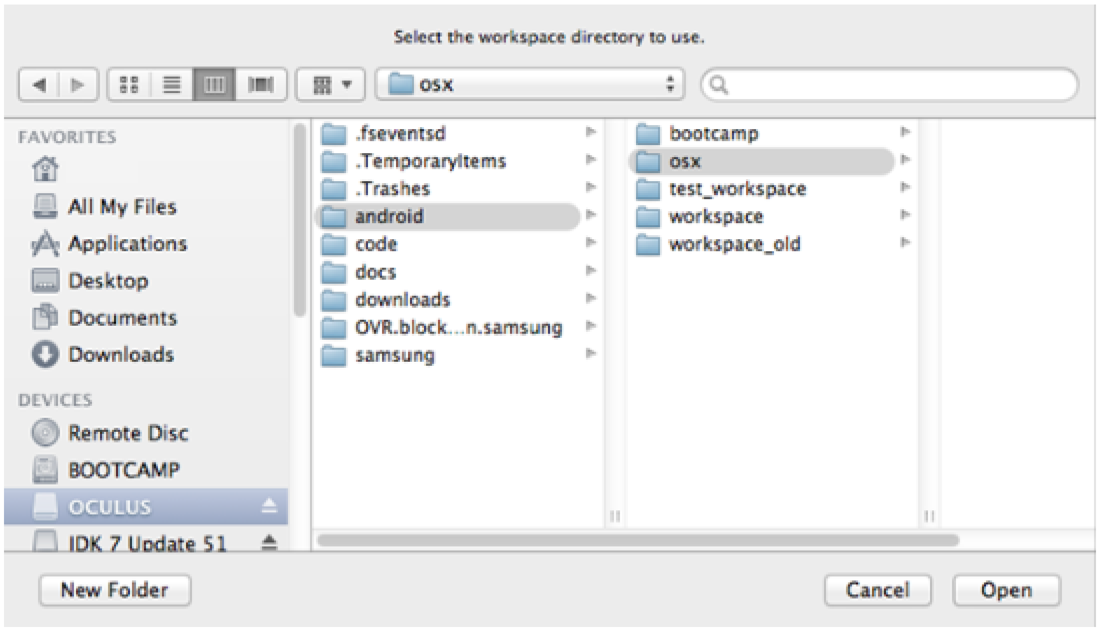
ADT stores your projects in a folder called a workspace.
Choose a workspace folder to use for this session.

Workspace: /Volumes/OCULUS/code

Use this as the default and do not ask again

[Eclipse]

Select *Browse* and locate or create the directory for your workspace:



Select the workspace directory to use.

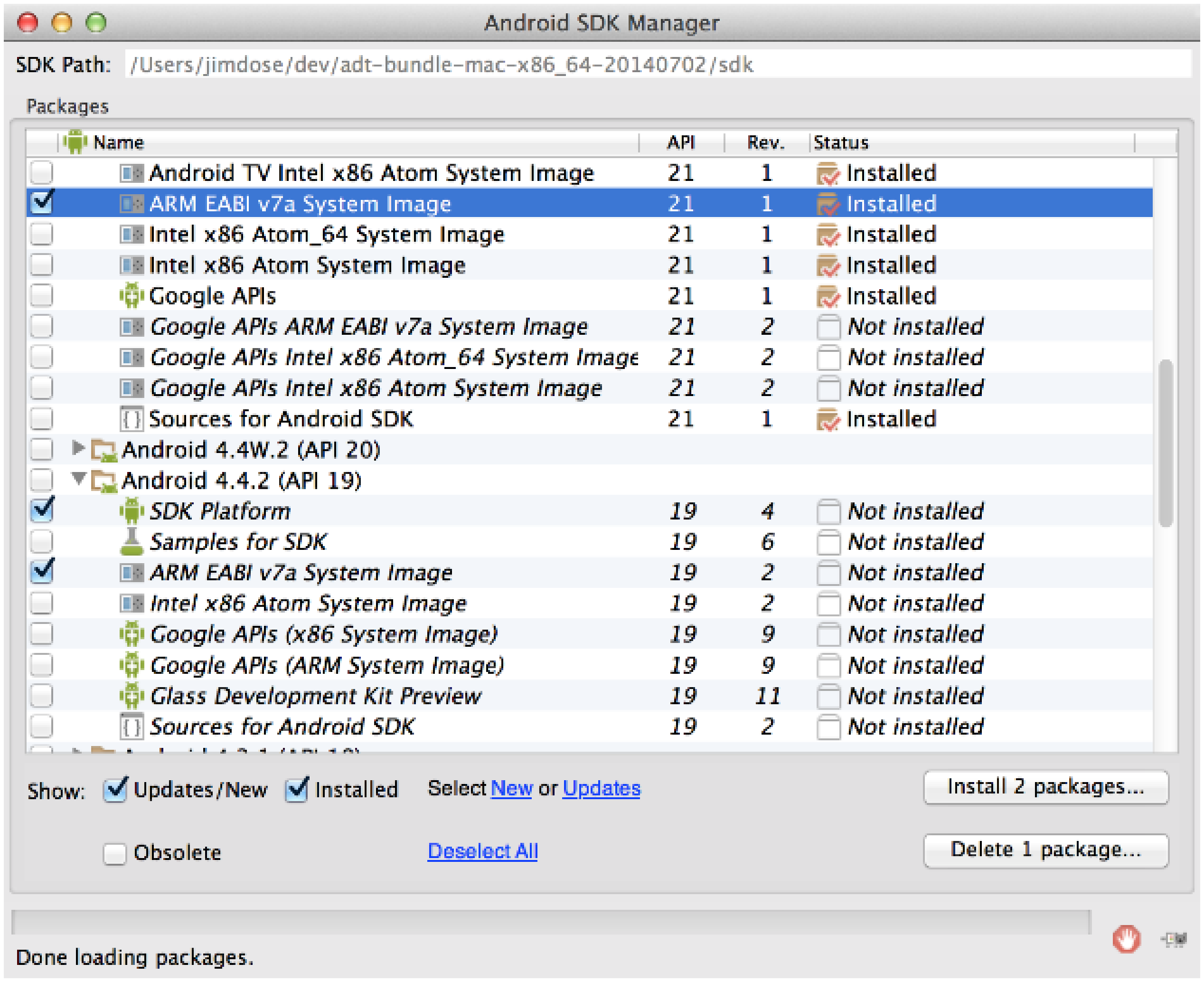
[OS X Finder]

If you plan to always use this same workspace, you can select the checkbox labeled *Use this as the default and do not ask again*. Choose *OK*.

IV.2.4 Installing Additional Packages and Tools

The Android SDK does not include everything you will need for development by default. You will need to download additional packages via the SDK Manager before you begin.

1. In Eclipse go to *Window -> Android SDK Manager* to open a window similar to the following:



Android SDK Manager

SDK Path: /Users/jimdose/dev/adt-bundle-mac-x86_64-20140702/sdk

Packages

	Name	API	Rev.	Status
	Android TV Intel x86 Atom System Image	21	1	Installed
✓	ARM EABI v7a System Image	21	1	Installed
	Intel x86 Atom_64 System Image	21	1	Installed
	Intel x86 Atom System Image	21	1	Installed
	Google APIs	21	1	Installed
	Google APIs ARM EABI v7a System Image	*21*	*2*	*Not installed*
	Google APIs Intel x86 Atom_64 System Image	*21*	*2*	*Not installed*
	Google APIs Intel x86 Atom System Image	*21*	*2*	*Not installed*
	Sources for Android SDK	21	1	Installed
	▶ Android 4.4W.2 (API 20)			
	▼ Android 4.4.2 (API 19)			
✓	*SDK Platform*	*19*	*4*	*Not installed*
	Samples for SDK	*19*	*6*	*Not installed*
✓	*ARM EABI v7a System Image*	*19*	*2*	*Not installed*
	Intel x86 Atom System Image	*19*	*2*	*Not installed*
	Google APIs (x86 System Image)	*19*	*9*	*Not installed*
	Google APIs (ARM System Image)	*19*	*9*	*Not installed*
	Glass Development Kit Preview	*19*	*11*	*Not installed*
	Sources for Android SDK	*19*	*2*	*Not installed*

Show: [✓ Updates/New] [✓ Installed] Select New or Updates — Install 2 packages...

Obsolete — Deselect All — Delete 1 package...

Done loading packages.

[Android SDK Manager]

1. Note that some packages are already selected for installation by default. Leave these projects selected.
2. If not already selected under *Tools*, select *Android SDK Tools*, *Android SDK Platform-tools*, and *Android SDK Build-tools*.
3. Open *Android 4.4.2 (API 19)* and select the items for *SDK Platform* and *ARM EABI v7a System Image* under it.
4. Click *Install X Packages*, where *X* is the number of selected packages (it may vary based on what needs to be updated).
5. On the next dialog, choose *Accept License*.
6. Click *Install* to install and update packages.

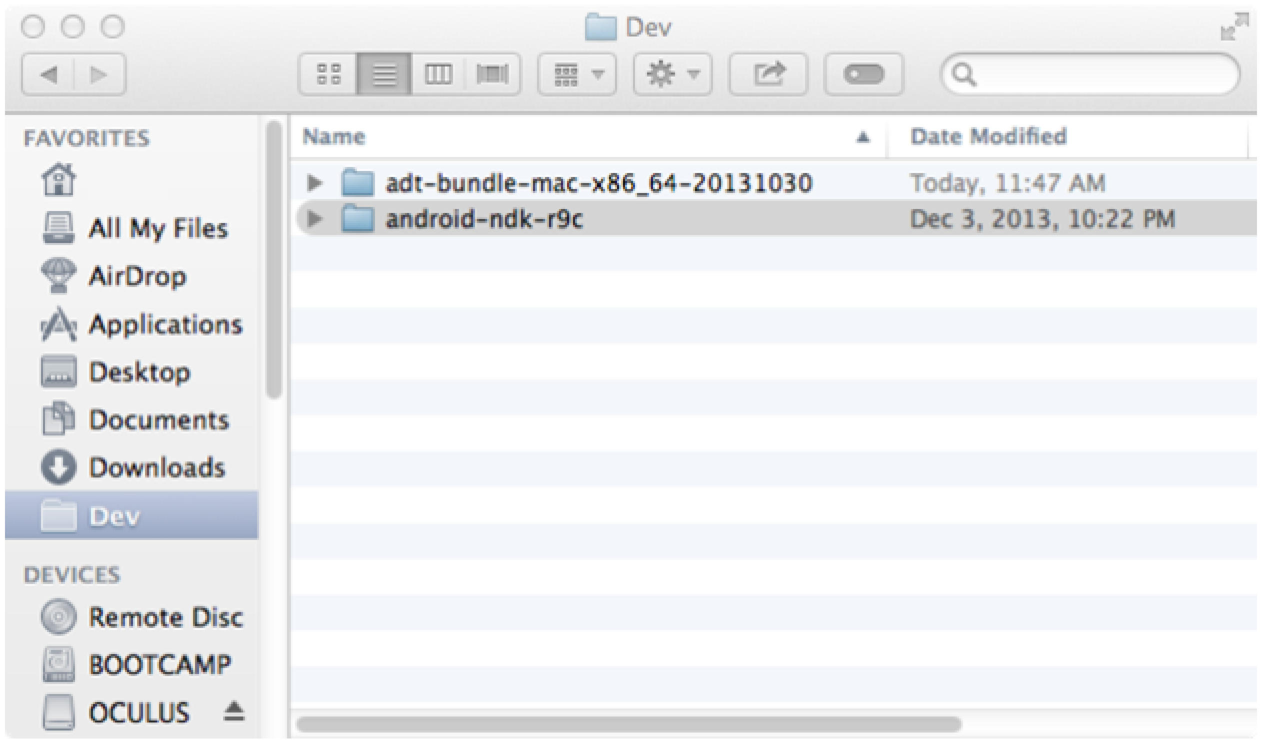
You may install additional packages above API 19 if you wish. Android SDK Tools 23.0.2, Android SDK Platform-tools 20 and Android SDK Build-tools 20 have all been verified to work correctly with the SDK.

IV.2.5 Android Native Development Kit

The 2.4 Android Native Development Kit (NDK) is a toolset that allows you to implement parts of your app using native-code languages such as C and C++. It is used extensively by the sample applications which come with this release.

The latest version which has been tested with this release is NDK 10 - it is available for download at the following location:
https://developer.android.com/tools/sdk/ndk/index.html

Once downloaded, extract the NDK to your home/dev folder (~/dev). Your dev folder should look something like the following:



Name	Date Modified
adt-bundle-mac-x86_64-20131030	Today, 11:47 AM
android-ndk-r9c	Dec 3, 2013, 10:22 PM

[OS X Finder]

Note that the ADT bundle and the NDK are extracted into their own folders within the Dev folder (in this case, folders that were in the root of their archive). The names of the folders, where the ADT bundle and the NDK reside, are not vitally important. As long as they are in separate folders and are not extracted directly into the Dev folder, any conflict between the two packages can be avoided. It is recommended you use the above naming scheme so that there is no question which version of the ADT bundle and the NDK are installed.

You can read more about installation and use of the NDK here:
http://developer.android.com/tools/sdk/ndk/index.html#installing

Configure Eclipse for NDK Usage

Launch Eclipse and go to the *ADT* -> *Preferences* window.

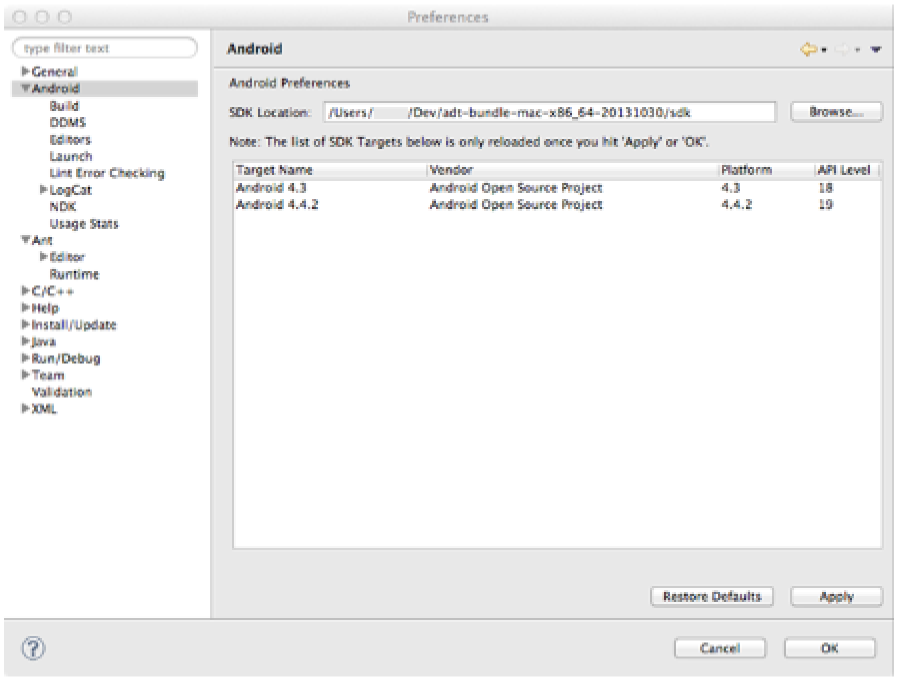
Under *Android*, verify that Eclipse knows the location of the Android Development Tools. If the *NDK* option is missing in the *Preferences* -> *Android* section, update the Eclipse ADT Plugin as follows:

1. Download and install the Eclipse ADT Plugin.
    (a) In the Eclipse menu go to: *Help->Install New Software*.
    (b) Click *Add* in the top-right corner.
    (c) In the Add *Repository* dialog that appears, enter "ADT Plugin" for the *Name* and the following URL:

```
    https://dl-ssl.google.com/android/eclipse
```

    (d) Click *OK*.
    (e) In the *Available Software* dialog, select the checkbox for *Developer Tools* and click *Next*.
    (f) Click *OK*.
    (g) In the next window, you'll see a list of tools to be download. Click *Next*.
    (h) Read and accept the license agreements, then click *Finish*. Click *OK* if you get any prompts regarding the security and authenticity of the software.
    (i) When the installation completes, restart Eclipse.

2. Configure the NDK path:
    (a) In the Eclipse menu go to: *Window* -> *Preferences* -> *Android*.
    (b) Under *Android* select *NDK*.
    (c) Set the *NDK Location* field to the directory where the NDK is installed.



Android Preferences

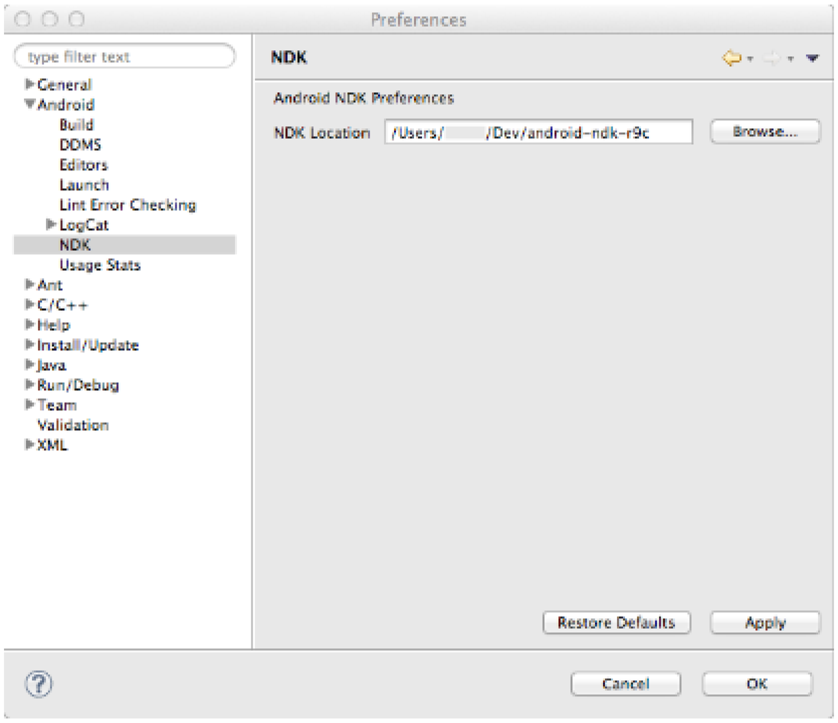
SDK Location: /Users/ /Dev/adt-bundle-mac-x86_64-20131030/sdk

Note: The list of SDK Targets below is only reloaded once you hit 'Apply' or 'OK'.

Target Name	Vendor	Platform	API Level
Android 4.3	Android Open Source Project	4.3	18
Android 4.4.2	Android Open Source Project	4.4.2	19

[Eclipse]

Under *Android* -> *NDK* set the NDK folder to the location where you installed the NDK:



Android NDK Preferences

NDK Location /Users/ /Dev/android-ndk-r9c

[Eclipse]

To set environment variables specifying the locations of Android SDK and NDK on your system, and to add Android tools to your global path:

1. Launch a terminal.
2. At the prompt type the following three lines:

```
echo ‘export ANDROID_HOME=~/dev/adt-bundle-mac-x86_64-20140702/sdk’ >> ~/.profile
echo ‘export ANDROID_NDK=~/dev/android-ndk-r9c’ >> ~/.profile
echo ‘export PATH=$PATH:$ANDROID_HOME/tools:$ANDROID_HOME/platform-tools:$
ANDROID_NDK’ >> ~/.profile
```

To verify that the Android NDK environment is set up correctly, launch a new terminal and go to the samples/hello-jni folder in the Android NDK. Execute the command `ndk-build`, which will compile the sample hello-jni application if everything is set up correctly.

IV.2.6 Apache Ant

Apache Ant is a Java library and command-line build system. It provides a number of built-in tasks which simplify building Java projects. The Apache Ant project is part of the Apache Software Foundation.

If you have already installed Xcode you may be able to skip this step.

The latest version, which has been tested with this release, is Apache Ant 1.9.3 and is available for download at the following location:
http://ant.apache.org/bindownload.cgi

Once downloaded, unzip Ant (or copy / move it if your web browser auto-expands .zip files for you) into your Dev folder alongside the ADT bundle and the NDK. As with the other packages, Ant should be in its own folder within Dev.

To set environment variables to specify the locations of JRE and ADT on your system, and to add Ant to your path:

1. Launch a terminal
2. Type the following three lines at the prompt:

```
echo ‘export ANT_HOME=~/dev/apache-ant-1.9.3’ >> ~/.profile
echo ‘export JAVA_HOME=$(/usr/libexec/java_home)’ >>~/.profile
echo 'export PATH="$PATH":~/dev/apache-ant-1.9.3/bin' >> ~/.profile
```

For additional information about the JAVA_HOME folder and how to determine its location, see:
http://stackoverflow.com/questions/18144660/what-is-path-of-jdk-on-mac
http://www.mkyong.com/java/how-to-set-java_home-environment-variable-on-mac-os-x/

To verify the `$PATH` variable and `*_HOME` variables are set correctly:

1. Launch a new terminal window (from Terminal, press Cmd+N). **BE SURE to do this from a new Terminal window.** The original Terminal window where you set the environment variables will not have an updated version of the environment variables, because it hasn't re-run ~/.profile.
2. At the prompt type:

```
echo $PATH
```

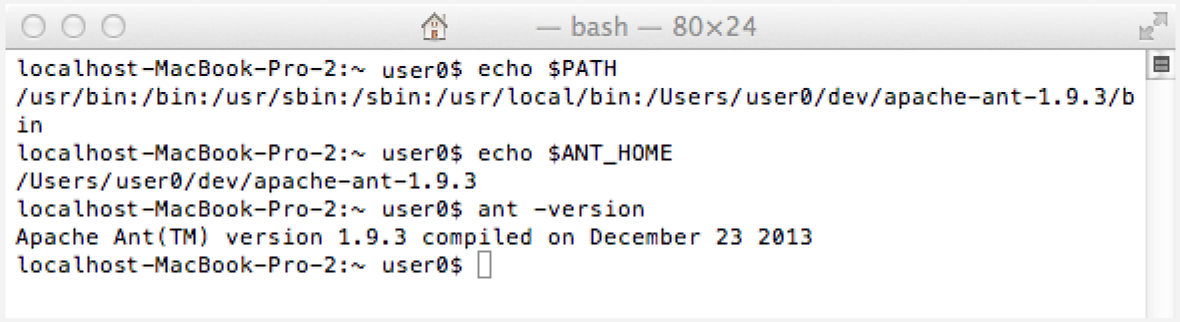
1. You should see the full path with your Ant bin folder at the end.
2. At the same terminal window prompt, type:

```
echo $ANT_HOME
```

1. Verify the Ant home path is the folder you installed it to. This particular path should NOT have /bin on the end.
2. To ensure the Ant binaries are accessible through the path, type `ant -version`
3. You should see the Ant version information output as in the screen capture below.

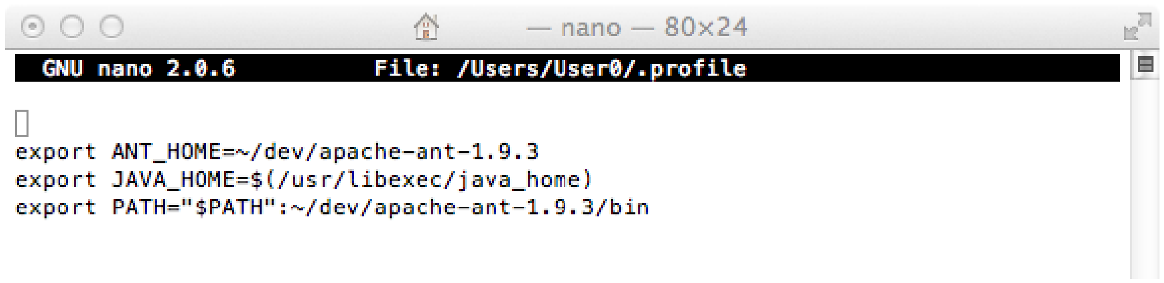
If you receive any errors, verify that the paths are all correct. If you have to correct anything, you can edit the ~/.profile file from Terminal using the following command:

```
sudo nano ~/.profile
```



```
localhost-MacBook-Pro-2:~ user0$ echo $PATH
/usr/bin:/bin:/usr/sbin:/sbin:/usr/local/bin:/Users/user0/dev/apache-ant-1.9.3/b
in
localhost-MacBook-Pro-2:~ user0$ echo $ANT_HOME
/Users/user0/dev/apache-ant-1.9.3
localhost-MacBook-Pro-2:~ user0$ ant -version
Apache Ant(TM) version 1.9.3 compiled on December 23 2013
localhost-MacBook-Pro-2:~ user0$
```

You should see something like the following screen where you can use the arrow keys to navigate the file and edit text:



```
  GNU nano 2.0.6             File: /Users/User0/.profile


export ANT_HOME=~/dev/apache-ant-1.9.3
export JAVA_HOME=$(/usr/libexec/java_home)
export PATH="$PATH":~/dev/apache-ant-1.9.3/bin
```

When you are finished editing, hit Ctrl+X to save, answer Y to overwrite and Enter to select the current file.

IV.3 Android Development Software Setup for Linux (Ubuntu 14.04)

IV.3.1 Java Development Kit

Installing the Java Development Kit (JDK) with `apt-get` is very straightforward. Just type the following into a console:

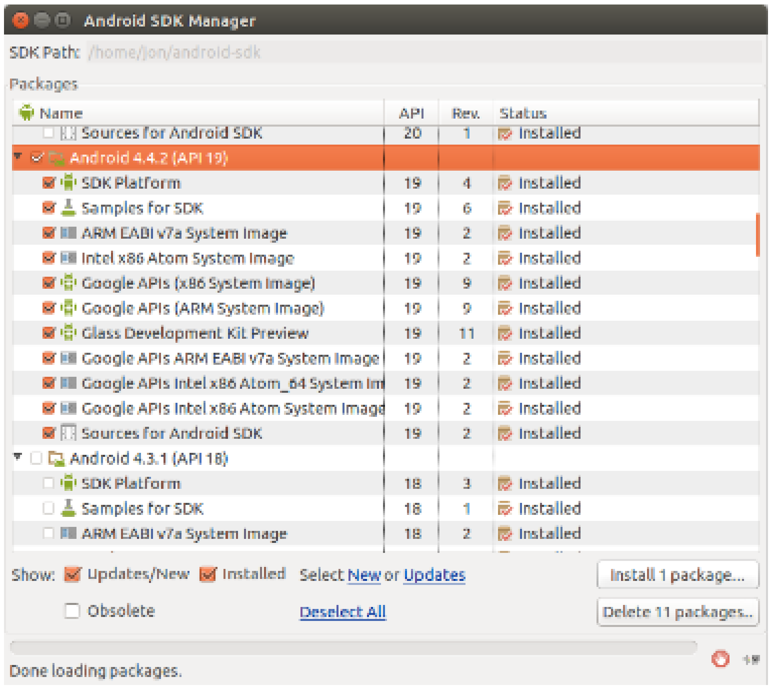
```
sudo apt-get update
sudo apt-get install default-jdk
```

IV.3.2 Android SDK

Download the SDK (ADT bundle) from: http://developer.android.com/sdk/index.html

Unpack the ZIP file (*adt-bundle-linux.zip*) and save it to *~/android-sdk*

Run ~/android-sdk/tools/android


Android SDK Manager

SDK Path: /home/jon/android-sdk

Packages

Name	API	Rev.	Status
Sources for Android SDK	20	1	Installed
Android 4.4.2 (API 19)			
SDK Platform	19	4	Installed
Samples for SDK	19	6	Installed
ARM EABI v7a System Image	19	2	Installed
Intel x86 Atom System Image	19	2	Installed
Google APIs (x86 System Image)	19	9	Installed
Google APIs (ARM System Image)	19	9	Installed
Glass Development Kit Preview	19	11	Installed
Google APIs ARM EABI v7a System Image	19	2	Installed
Google APIs Intel x86 Atom_64 System Im	19	2	Installed
Google APIs Intel x86 Atom System Image	19	2	Installed
Sources for Android SDK	19	2	Installed
Android 4.3.1 (API 18)			
SDK Platform	18	3	Installed
Samples for SDK	18	1	Installed
ARM EABI v7a System Image	18	2	Installed

Show: ✓ Updates/New ✓ Installed Select New or Updates

☐ Obsolete Deselect All

Done loading packages.

[Android SDK Manager]

1. Note that some packages are already selected for installation by default. Leave these projects selected.
2. Check *Android 4.4.2 (API 19)*.
3. Click the *Install X Packages* button, where *X* is the number of selected packages (it may vary based on what needs to be updated).
4. On the next dialog, choose *Accept License*.
5. Click *Install* to install and update packages.
6. Some examples may use an older API version than 19. You may need to download other API versions if you have trouble building a particular project.

Edit your ~/.bashrc and put this at the top of the file:

```
export PATH=${PATH}:~/android-sdk/tools
export PATH=${PATH}:~/android-sdk/platform-tools
```

IV.3.3 Android NDK

Download the Linux NDK from:
https://developer.android.com/tools/sdk/ndk/index.html#download

Unpack the .tar.bz2 to ~/ndk.

V. Troubleshooting

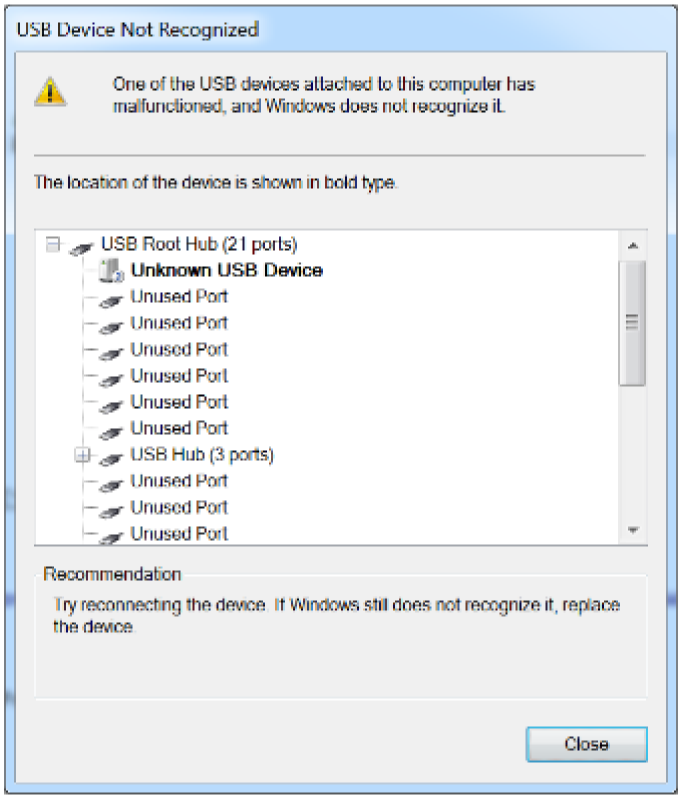
V.1 Device Troubleshooting

V.1.1 View is tilted

If the headset view is tilted to the left or right, there is probably an issue with sensor calibration. Take off the headset and place it face down on a flat surface for around 5 seconds to prompt the device to reorient the sensors. When you put the device back on your head, the view should be level.

V.1.2 Device not (or no longer) recognized

Even if a device worked fine previously, it may enter a state in which it is no longer recognized. When using Windows you may get the following dialog:



USB Device Not Recognized

One of the USB devices attached to this computer has malfunctioned, and Windows does not recognize it.

The location of the device is shown in bold type.

```
USB Root Hub (21 ports)
    **Unknown USB Device**
    Unused Port
    Unused Port
    Unused Port
    Unused Port
    Unused Port
    Unused Port
  + USB Hub (3 ports)
    Unused Port
    Unused Port
    Unused Port
```

Recommendation

Try reconnecting the device. If Windows still does not recognize it, replace the device.

[Windows 7]

In most cases, rebooting the device should be sufficient.

Windows appears to sometimes auto-update or auto-rollback the correct Samsung USB driver when the phone is reconnected. If this occurs, you should see a Windows notification that it is installing a driver when you connect your phone via USB. Should this happen, reinstall the correct driver.

V.1.3 Device regularly reconnects

The device may enter a state in which it reconnects regularly, or in the middle of sessions.

In Eclipse you may get the following message:

```
[<data> <time> - DeviceMonitor] Adb connection Error: An existing connection was forcibly closed by the remote hos
```

Solution: reboot the device.

V.1.4 I need to run my app outside of the Gear VR headset

Running a VR application with the `vr_only` manifest tag currently requires placing the phone into the Gear VR headset. This can be a time consuming process for making iterative changes to applications. We are working to resolve this in order to streamline the development process.

As a workaround, the `vr_only` tag can be changed to `vr_dual` in order to view your app outside of Gear VR. Unfortunately, this requires a re-compile.

Be sure to set this back to `vr_only` when analyzing app performance:

```
<meta-data android:name="com.samsung.android.vr.application.mode" android:value="vr_only"/>
```

V.2 Android Environment Troubleshooting

V.2.1 Ant build failure

When building your project using the Ant build tools, you may run into build.xml errors such as the following:

> *C:\Dev\Android\android_adt_bundle_*20140702*\sdk\tools\ant\build.xml:653: The following error occurred while executing this line:*

C:\Dev\Android\android_adt_bundle_20140702\sdk\tools\ant\build.xml:698: null returned: 1

If you add the `-verbose` option to the Ant build, you will see an error such as:

invalid resource directory name: C:\Dev\Android\VrTestApp\bin\res/crunch

This appears to happen for projects which refer to library projects - there is currently no explanation why it occurs. To fix the problem, delete the bin/res/crunch folders that are generated in VrLib/ and VrTestApp/.

V.2.2 Eclipse Problems

Spaces in Android tool paths.
Make sure there are NO SPACES in any of your Android tool paths. If there are, follow all of the installation instructions from the start without spaces in any paths. The exception is the Java Development Kit on Windows, which by default installs to "C:\Program Files (x86)" for 32-bit or "C:\Program Files" for 64-bit. Those paths are acceptable as long as JAVA_HOME is set appropriately (without quotes -- see the note in the section IV.1.1).

Build/clean error due to missing NDK path.
Eclipse sometimes loses the NDK path even though you set the path during the software installation process. When this happens you may get a build/clean error similar to the one below:

```
**** Clean-only build of configuration Default for project VrExperiments ****
sh ndk-build clean
Error: Cannot run program "sh": Launching failed
**** Build Finished ****
```

Solution: set the NDK path at: *Menu* -> *Window* -> *Preferences* -> *Android* -> *NDK*.

Unable to launch due to errors
Although you just successfully built your application, you get a message that the project contains errors that need to be fixed before you can launch the application.

Solution: go to the *Problems* tab (typically at the bottom) and delete all the errors.

Compatibility Warnings When Starting Eclipse

If you already have an existing installation of the Android Development Tools prior to 23.0.2, you may see compatibility errors when starting Eclipse depending on which packages you downloaded from the SDK Manager. In some cases you may be able to fix these compatibility issues by going to *Eclipse* -> *Help* -> *Install New Software*. Add the URL https://dl-ssl.google.com/android/eclipse/ in the *Work with:* field and select *Add*. Name the repository “Eclipse”, select the packages that appear under *Developer Tools* and choose *Next*. If you receive installation errors, you can try to resolve these (you should be offered some resolution steps) or try installing one package at a time. If you continue to receive errors, try the steps below.

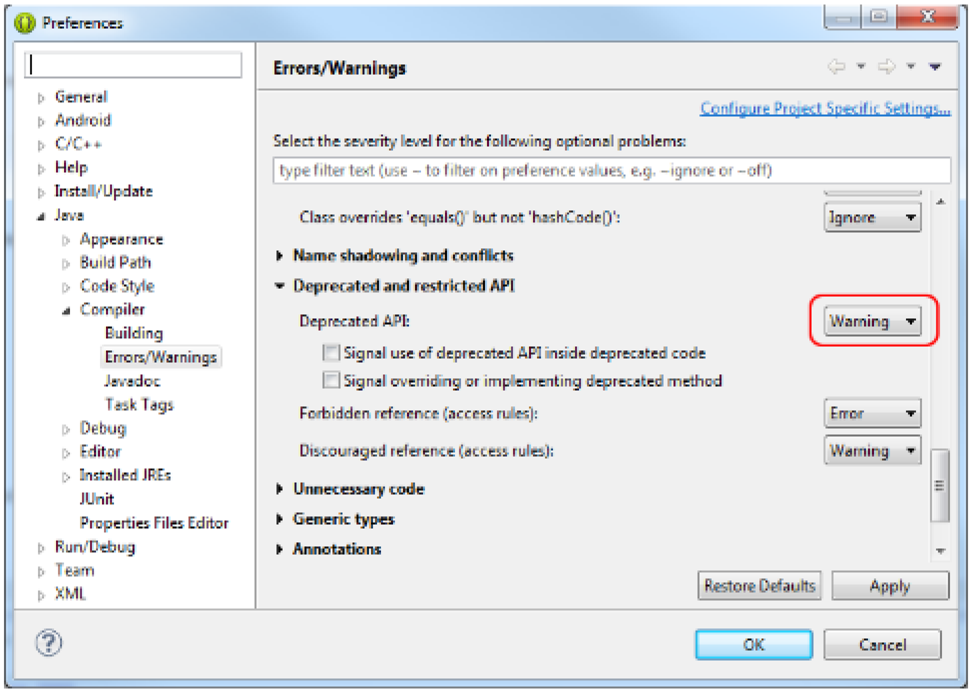
Make sure you have downloaded the latest ADT bundle and verify that all of the required environment variables (including PATH) point to the location of the new bundle. Launch the SDK Manager from the new ADT bundle installation and download the required packages as indicated in section IV. Launch Eclipse from the new bundle, go to *Window* -> *Preferences* and verify that the SDK Location field there points to the location where you installed the new version of the ADT bundle. Re-verify that all paths in Eclipse and all system environment variables are correct and reboot.

Missing NDK Option in Android Menu
At this point you should verify that the NDK path is set correctly in the *Eclipse Settings* as shown in section IV.1.5 (Windows), IV.2.5 (OS X), or IV.3.3. (Ubuntu). If NDK does not appear under *Preferences* -> *Android*, make sure you have all of the latest development tools installed.

In Eclipse, go to *Help* -> *Install New Software*. In some versions of ADT the existing links for Android Development Tools Update Site appear to be broken (the https is paired with the wrong URL). If any of the pre-defined links for *Work with:* field do not allow proper installation, click *Add...*, input "eclipse" for *Name:* and in the Location field type: https://dl-ssl.google.com/android/eclipse/

Download all of the packages under *Development Tools* and complete the installation steps.

Java Build Errors
The SDK currently uses some deprecated Java interfaces. If you see build errors (listed under *Errors* and preceded by a red X icon) related to Java deprecation, such as “The type ActivityGroup is deprecated”, then set deprecation errors to warnings. Go to *Window* -> *Preferences* -> *Java* -> *Compiler* -> *Errors/Warnings* and scroll down to the *Deprecated and Restricted API* section. Next to *Deprecated API*, change *Error* to *Warning* or *Ignore* as shown below:



Preferences

Errors/Warnings

Configure Project Specific Settings...

Select the severity level for the following optional problems:

type filter text (use ~ to filter on preference values, e.g. ~ignore or ~off)

Class overrides 'equals()' but not 'hashCode()': Ignore

Name shadowing and conflicts

Deprecated and restricted API

Deprecated API: Warning

☐ Signal use of deprecated API inside deprecated code

☐ Signal overriding or implementing deprecated method

Forbidden reference (access rules): Error

Discouraged reference (access rules): Warning

Unnecessary code

Generic types

Annotations

[Eclipse]

Last Update: Nov 10, 2014