CS108 Java Android API and Programmer's Guide

Version 7.0

2022 07 06

Chapter 1: Release Notes

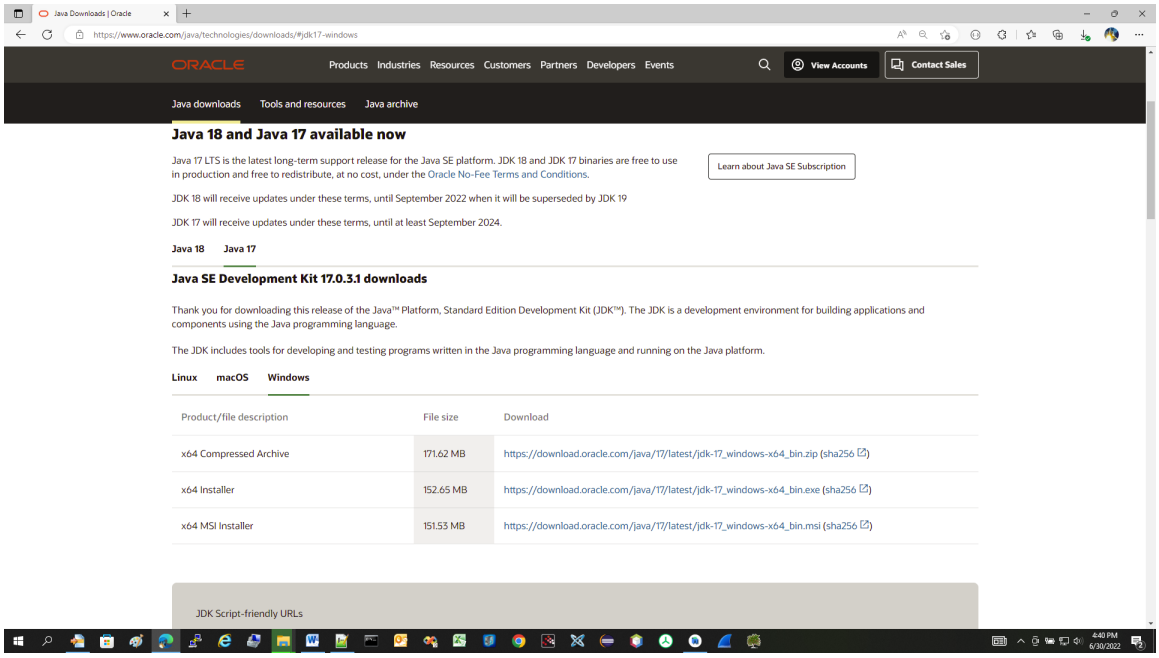
Dates	Release	Description
2017 05 02	1.0	Initial Release
2017 12 11	2.0	Add regulatory region and serial number API
2018 07 23	3.0	Add more details to chapter 3 'Programming Environment'. Update chapter 4 'Class and method' and chapter 5 'Example command sequences'
2018 08 21	4.0	Add read tag TID bank command sequence example
2018 10 16	5.0	How to import CS108 library into customer own project
2020 09 11	6.0	Update Android Studio version to 4.X, Java version updated, Demo App updated, Library Class and Method updated to latest V1.19.0
2022 07 06	7.0	Update Android Studio, Java version and their operations in sections 3.1, 3.4 to 3.6. Update project demo download from github in section 3.2. Update class information in section 3.7 and 4. Update procedures in section 5.

Chapter 2: Content

Chapter 3: Programming Environment

3.1 System Requirements

1) The demo project is developed under following computer configuration
    a. Android Studio Chipmunk | 2021.2.1
    b. Embedded JDK version 11.0.12 or above (Oracle Java 17 or above)
    c. Microsoft Windows 10 Pro
    d. 64-bit operating system, x64-based processor
    e. Intel(R) Core™ i5-4200U CPU @ 1.60GHz, 229MHz
    f. Physical Memory(RAM) 8.00 GB
    g. Hard-disk 500 GB with more than 20 GB free space
2) Download and install Java JDK from http://www.oracle.com/technetwork/java/javase/downloads/index.html
    a. Select “JDK Download” -> Java 17 -> Windows
    b. Select ‘jdk-17_windows-x64_bin.exe or .msi’ for Windows x64

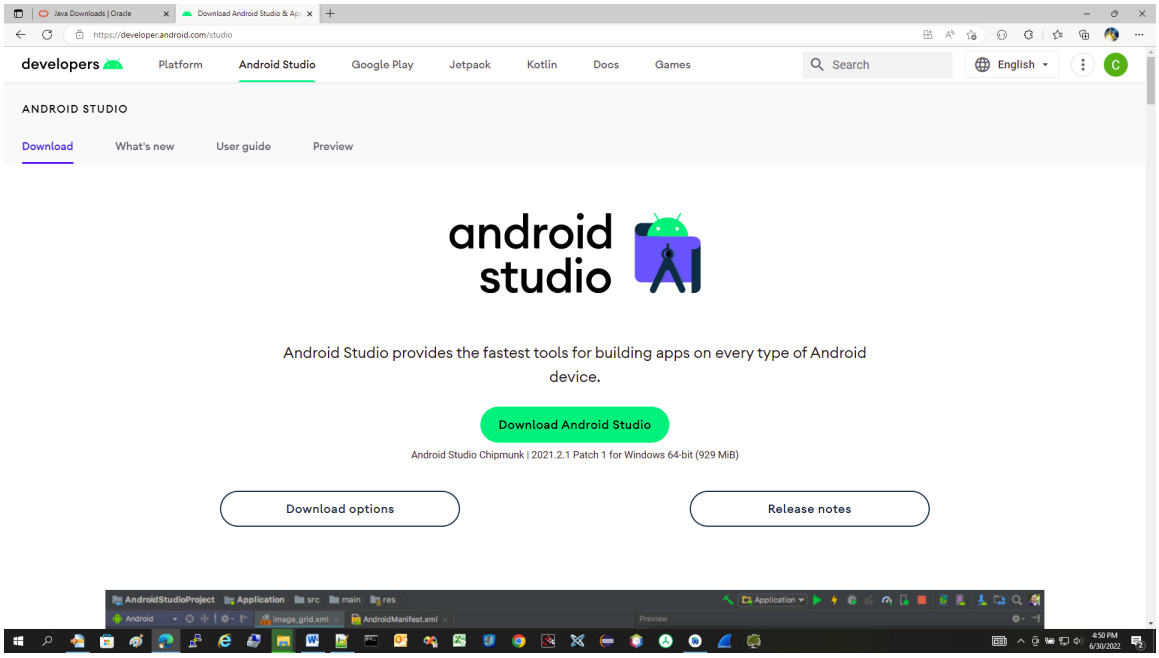


c. Run the downloaded installer and continue

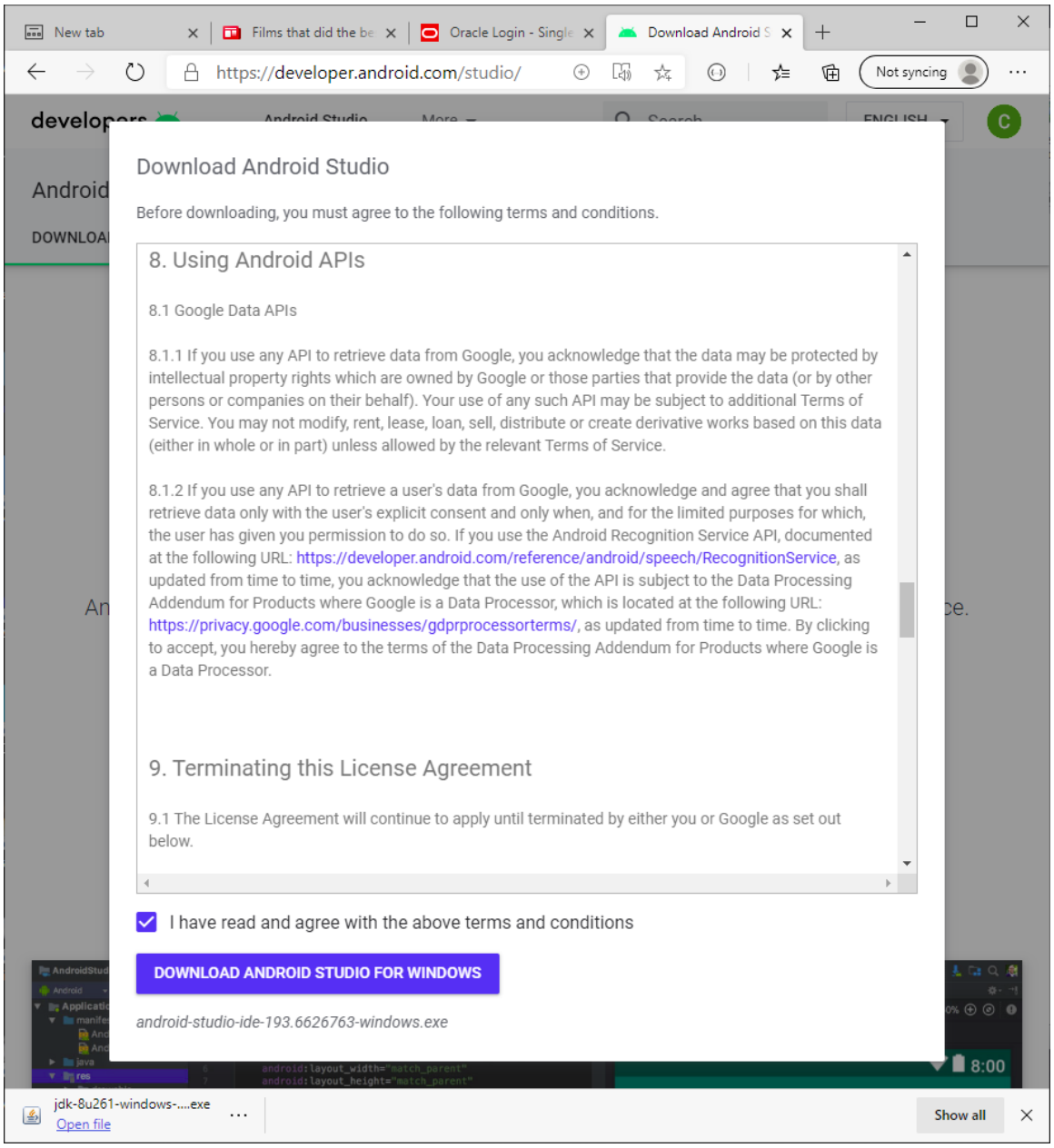
d. Check the presence of Java in command prompt by typing “java –version”

3) Download and install latest Android Studio from https://developer.android.com/studio/

a. Press “Download Android Studio”

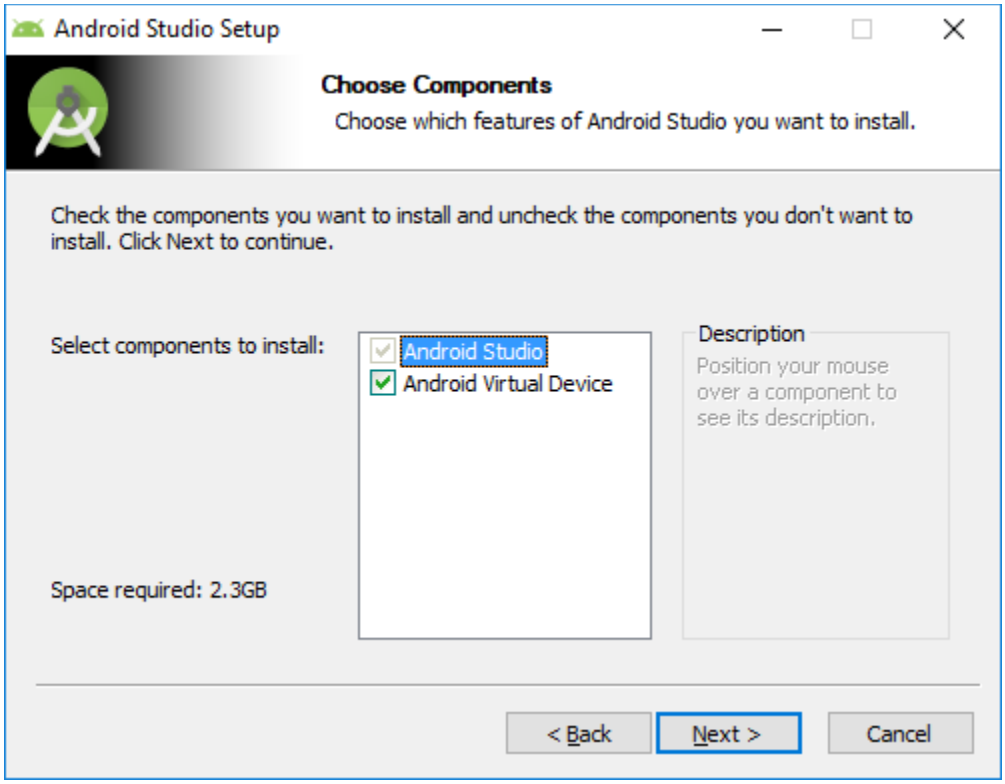


b. Tick the box “I have read and agree the above items and conditions” and press “Download Android Studio for Windows”

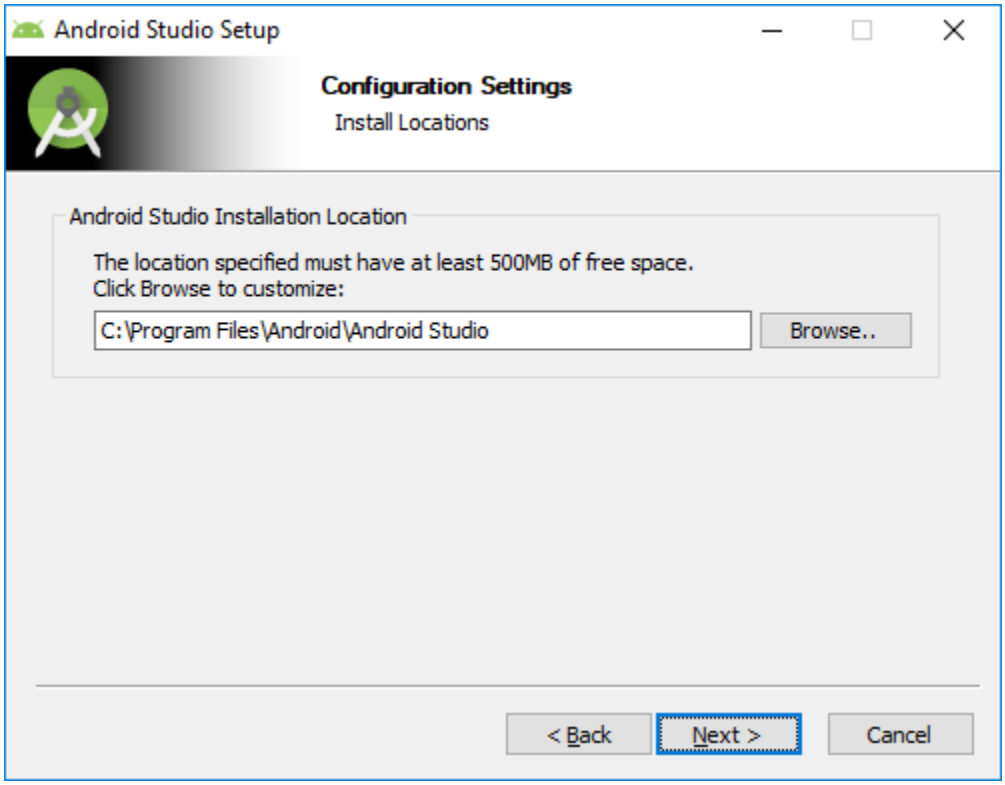


c. “Run” the downloaded installer and continue up to the “Welcome to Android Studio Setup” page.

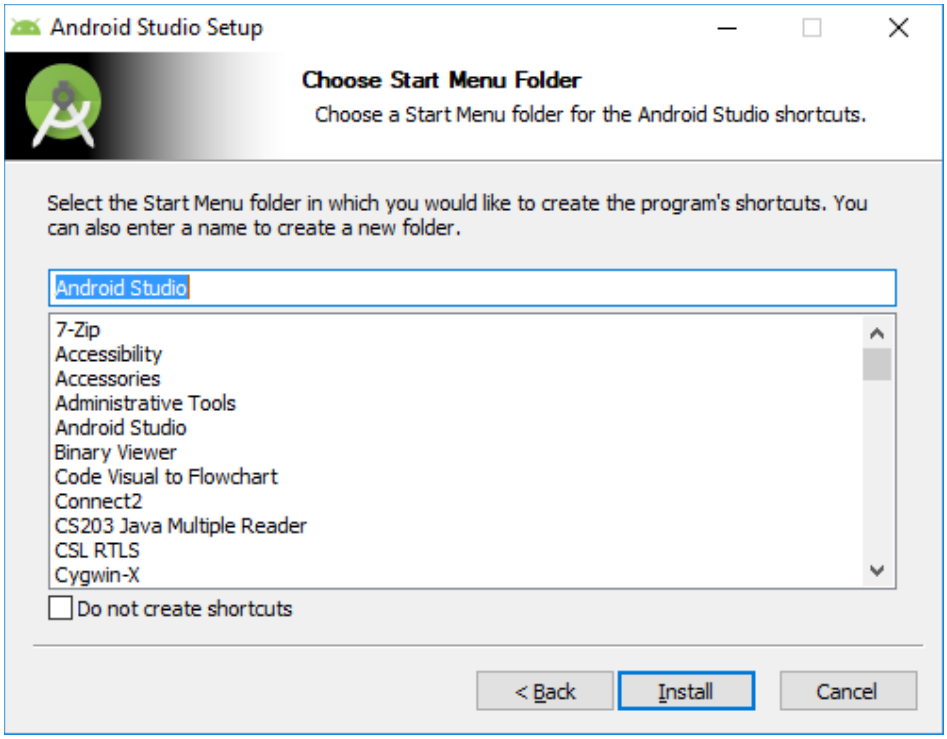
d. Tick “Android Virtual Device” and Select “Next”



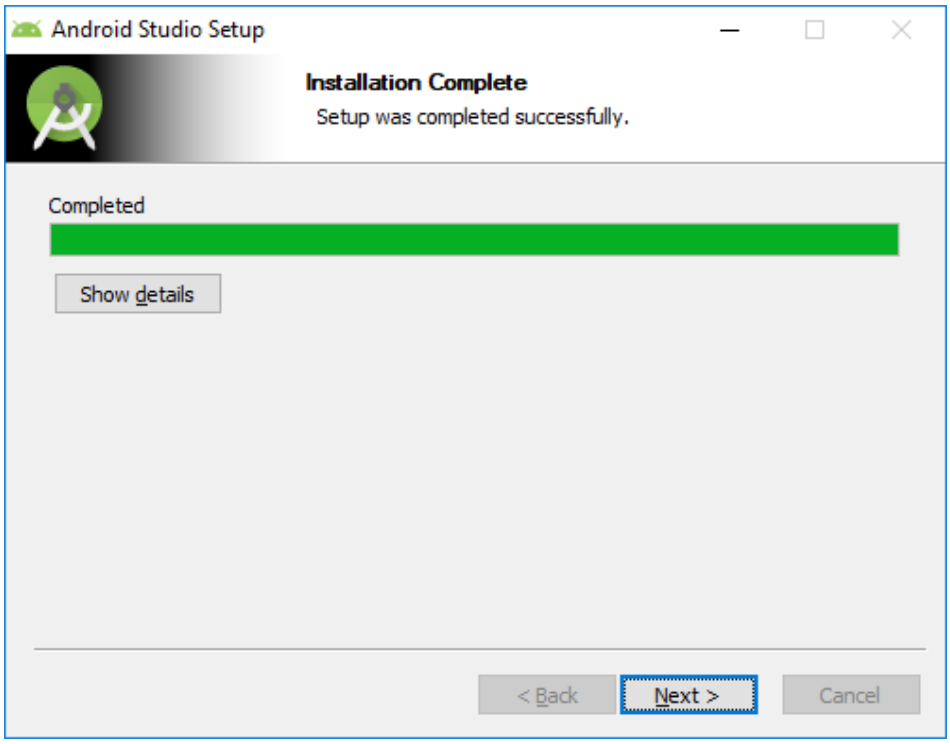
e. Select “Next”



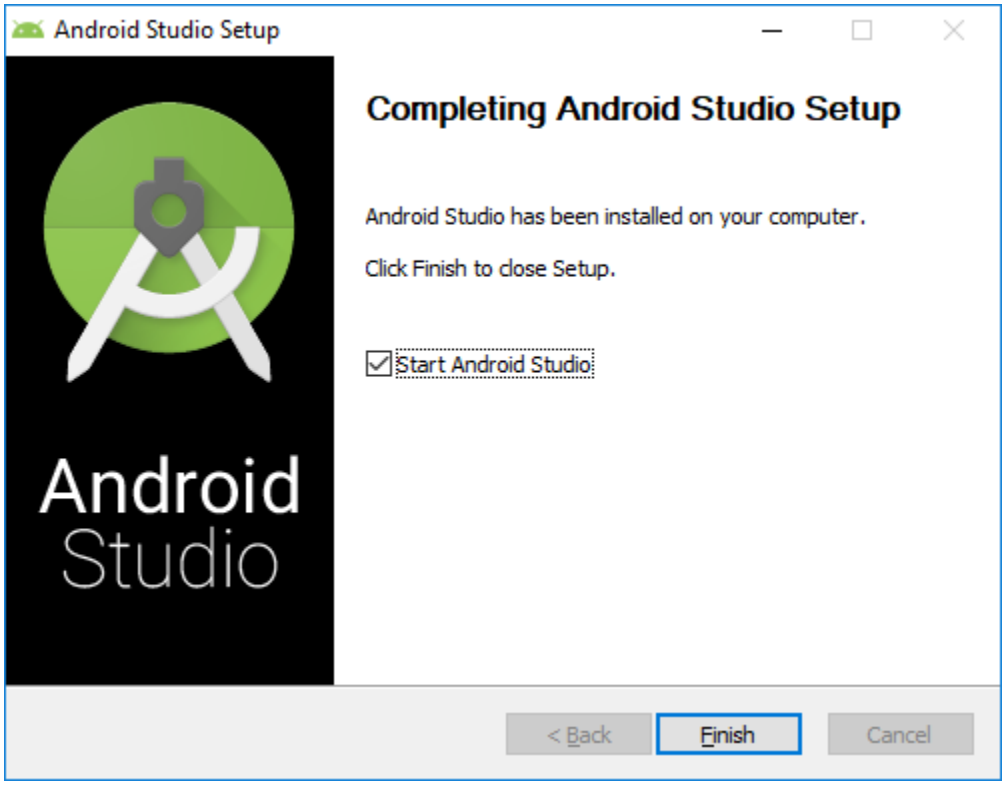
f. Select “Install” and Wait



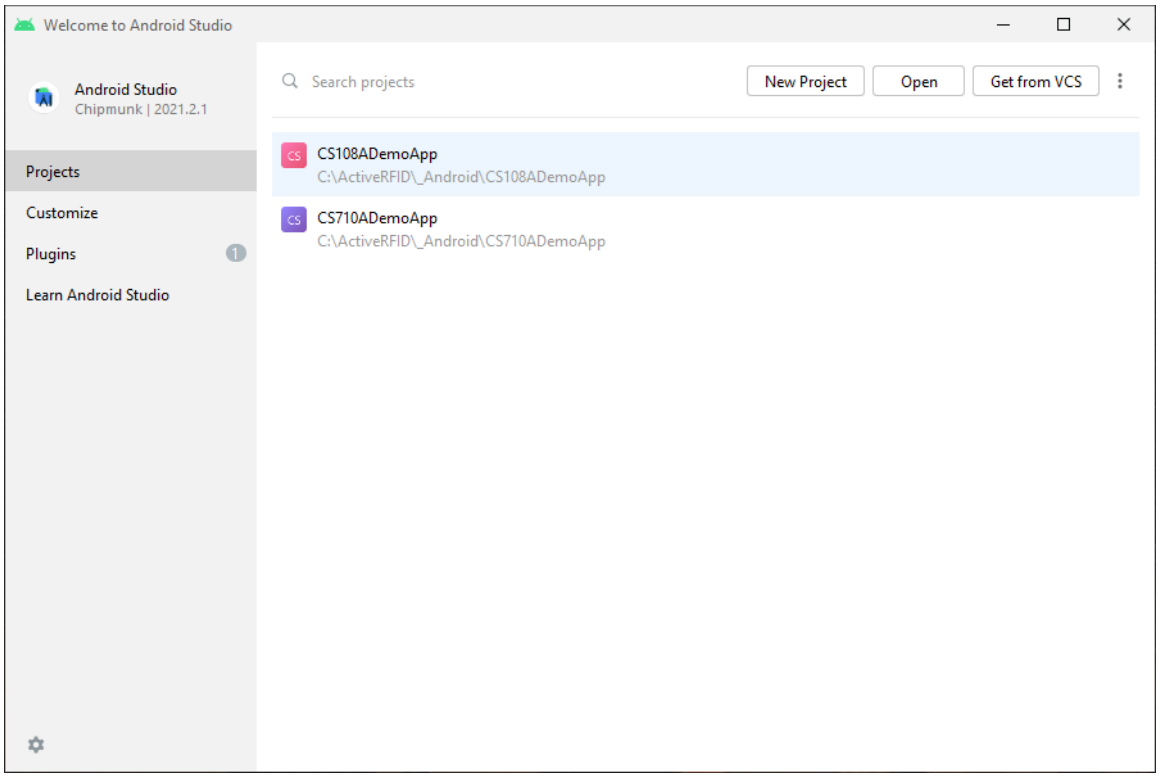
g. Select “Next”



h. Tick “Start Android Studio” and Press “Finish”



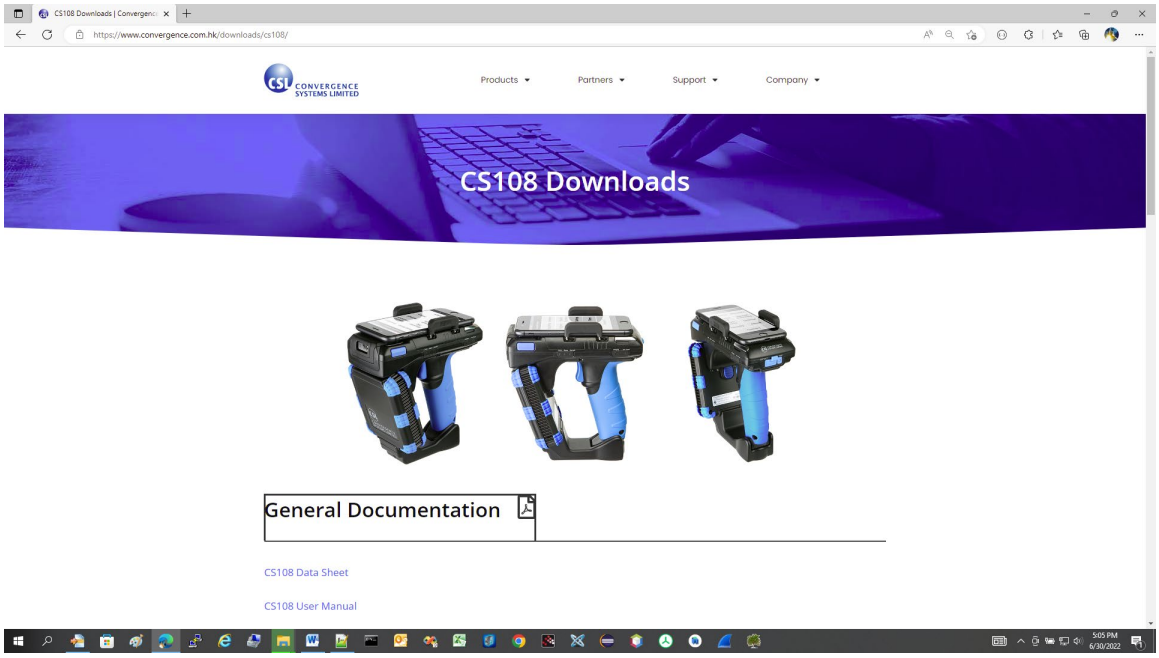
i. Final display

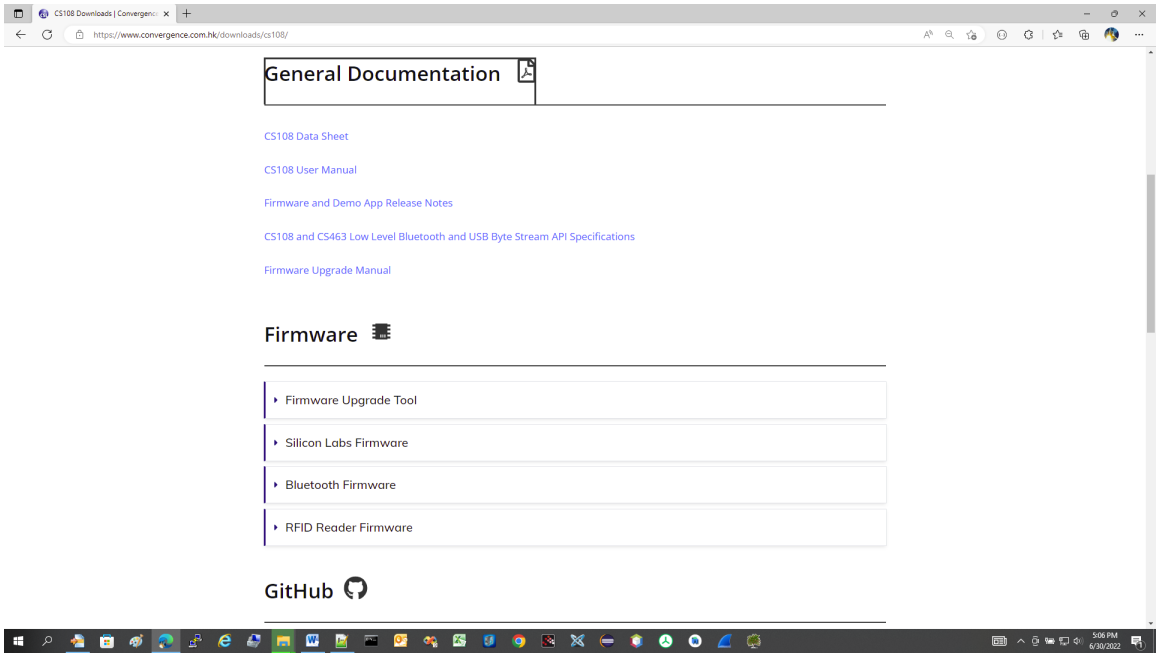


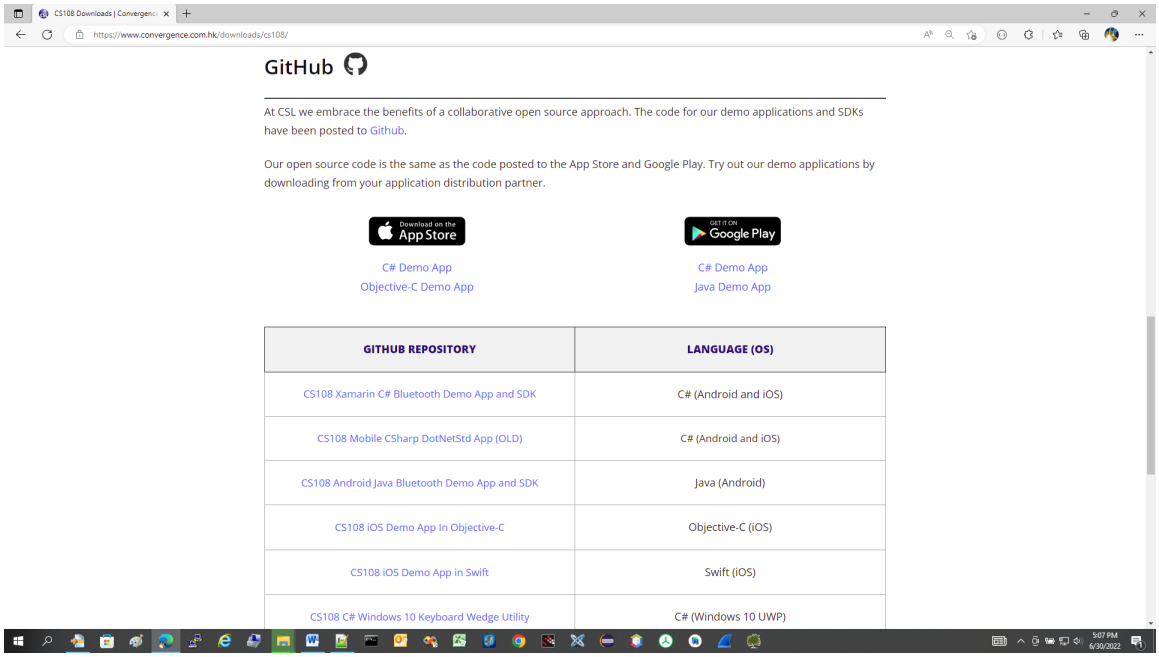
3.2 CS108 Project Download

1) Please download Demo code from https://www.convergence.com.hk/downloads/cs108/

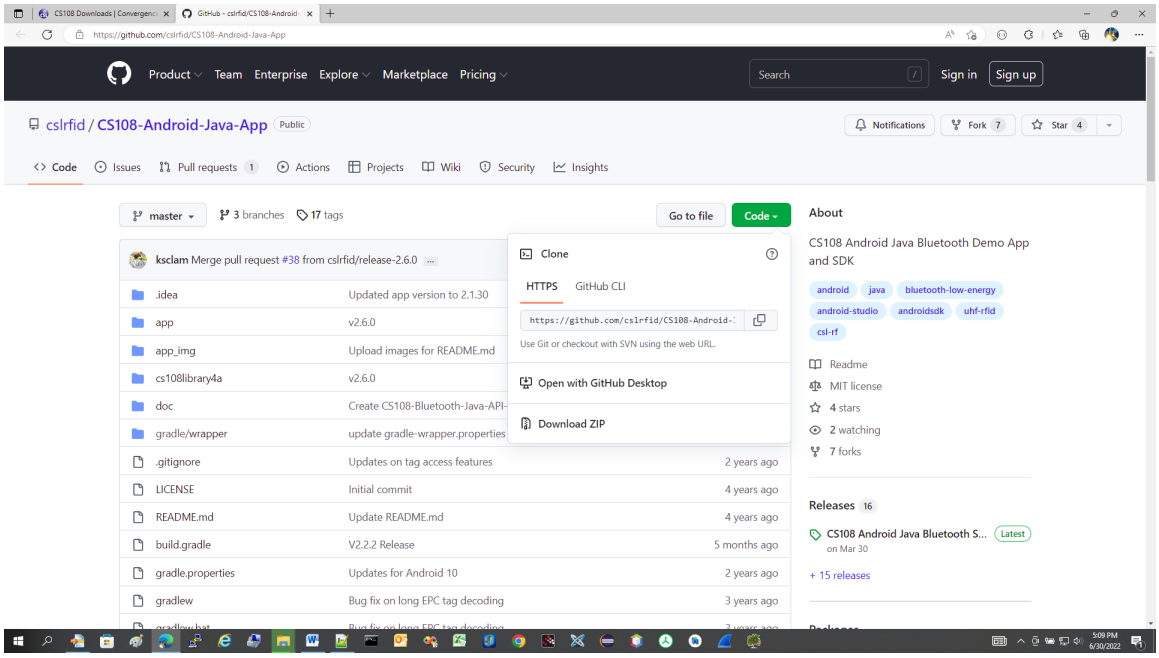
   i. Select “CS108 Android Java Bluetooth Demo App and SDK” to go to GitHub





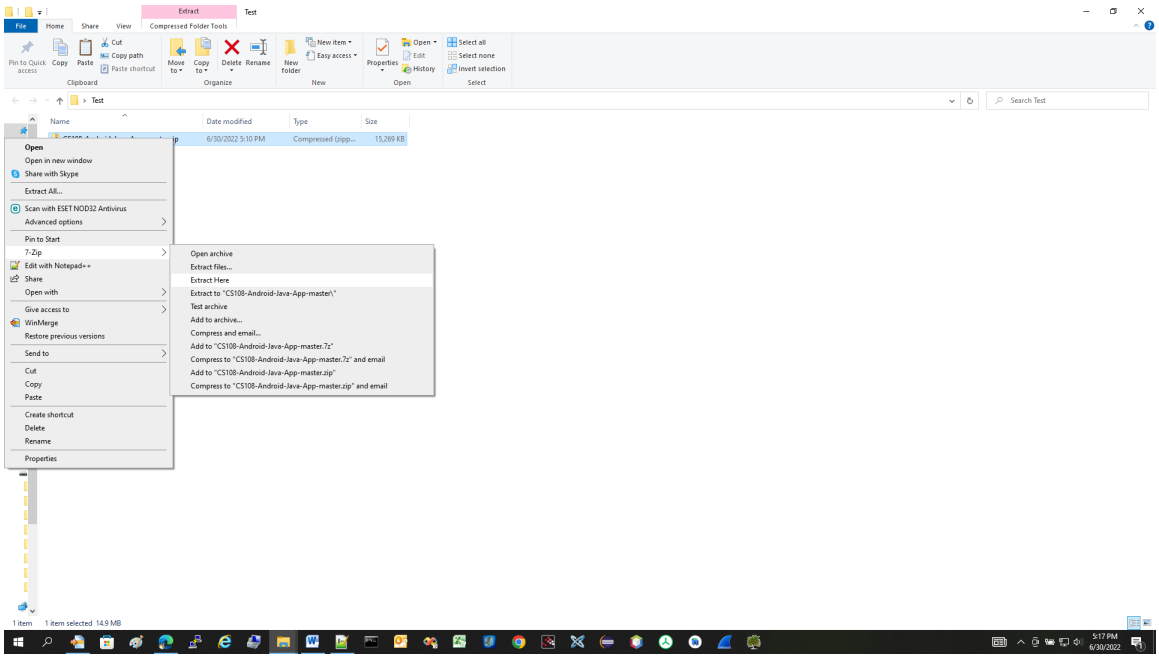


ii. Select “Code” -> “Download ZIP” to download the latest code.

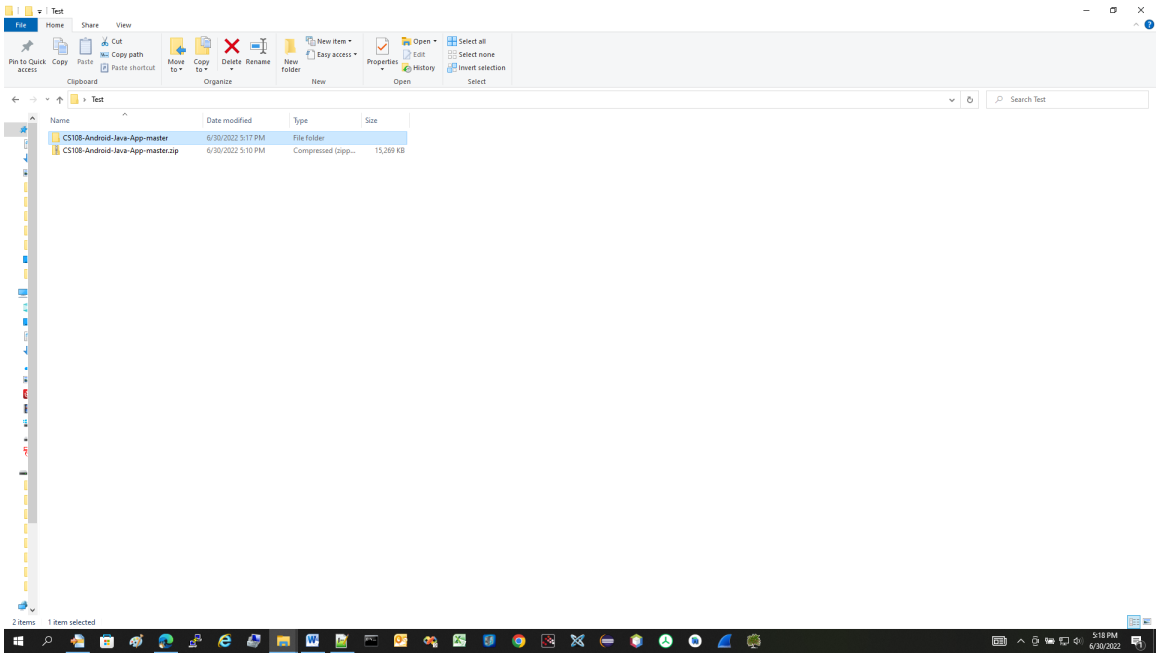


iii. Find your saved file and move the zip file in your project sub-directory

iv. Unzip the zip file

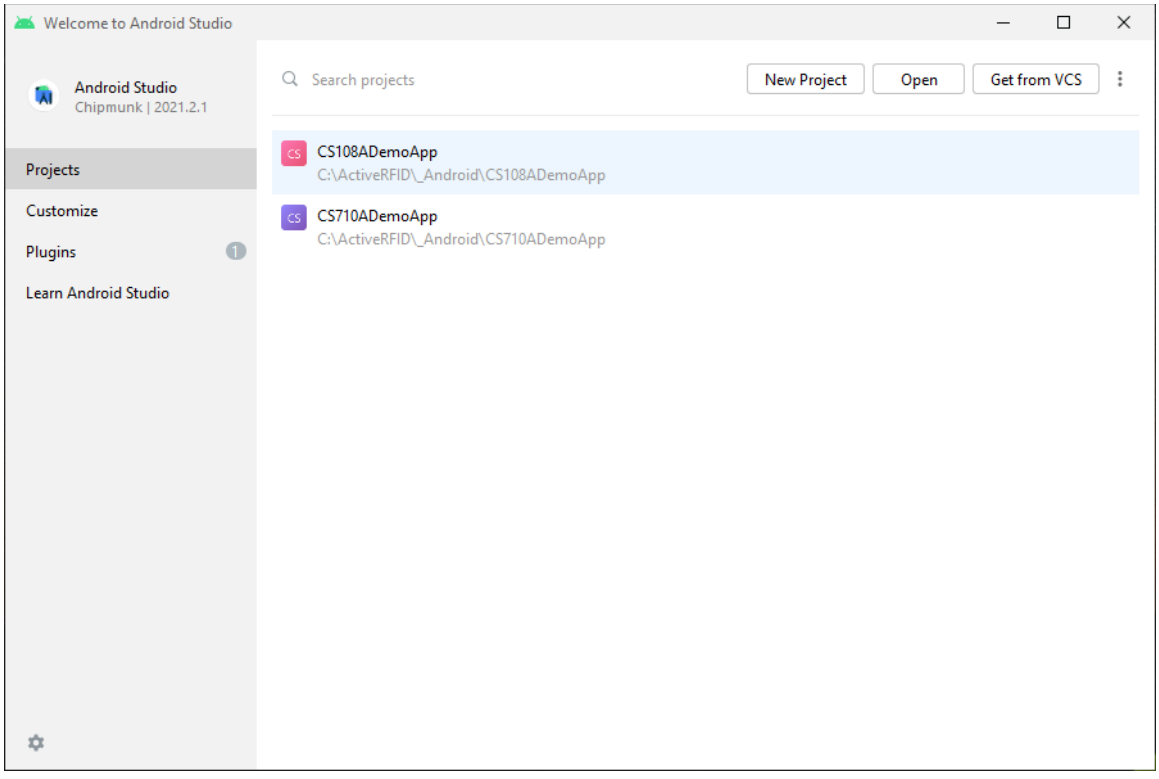


v. Final display

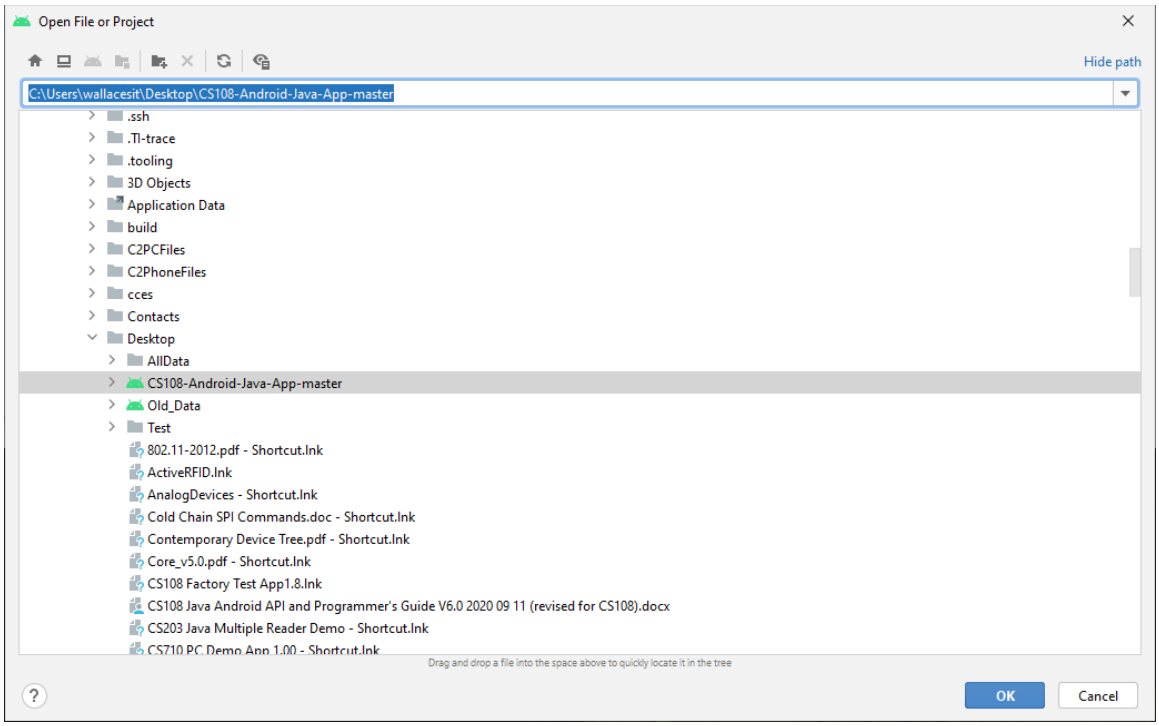


2) Android Studio SDK platform setup for the CS108ADemo project

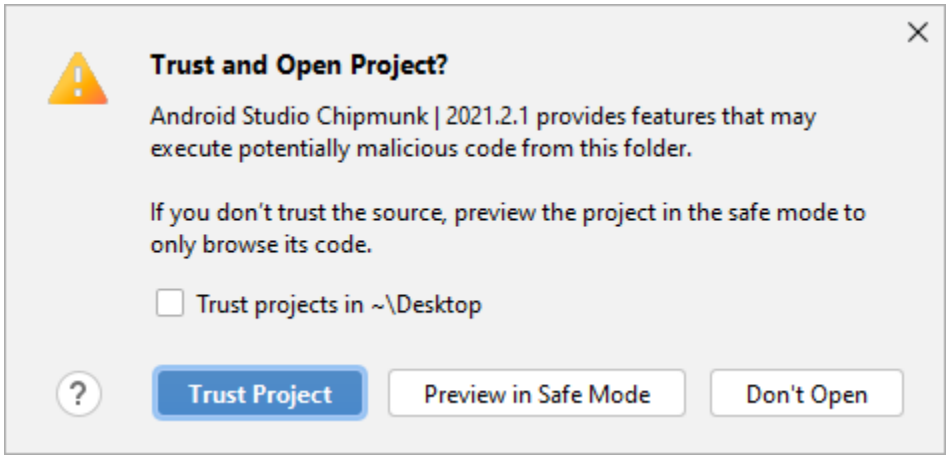
i. Open android Studio



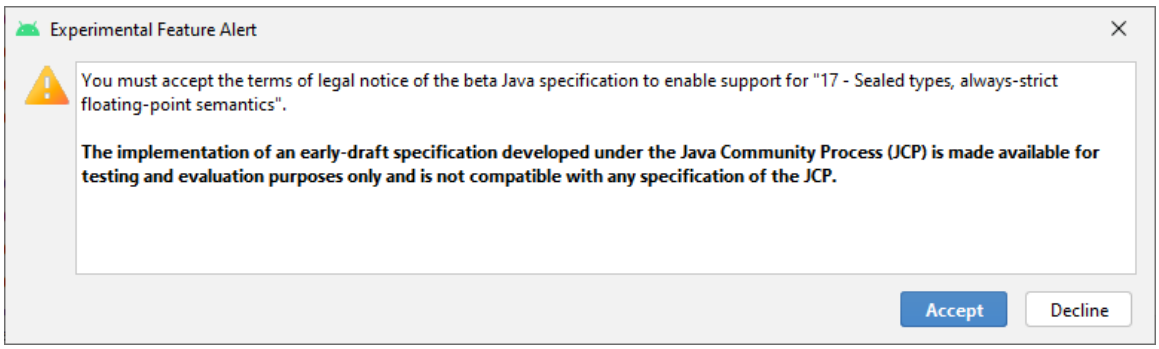
ii. Select “Projects” -> “Open”, the unzipped “CS108ADemoApp” project. And Select “OK”



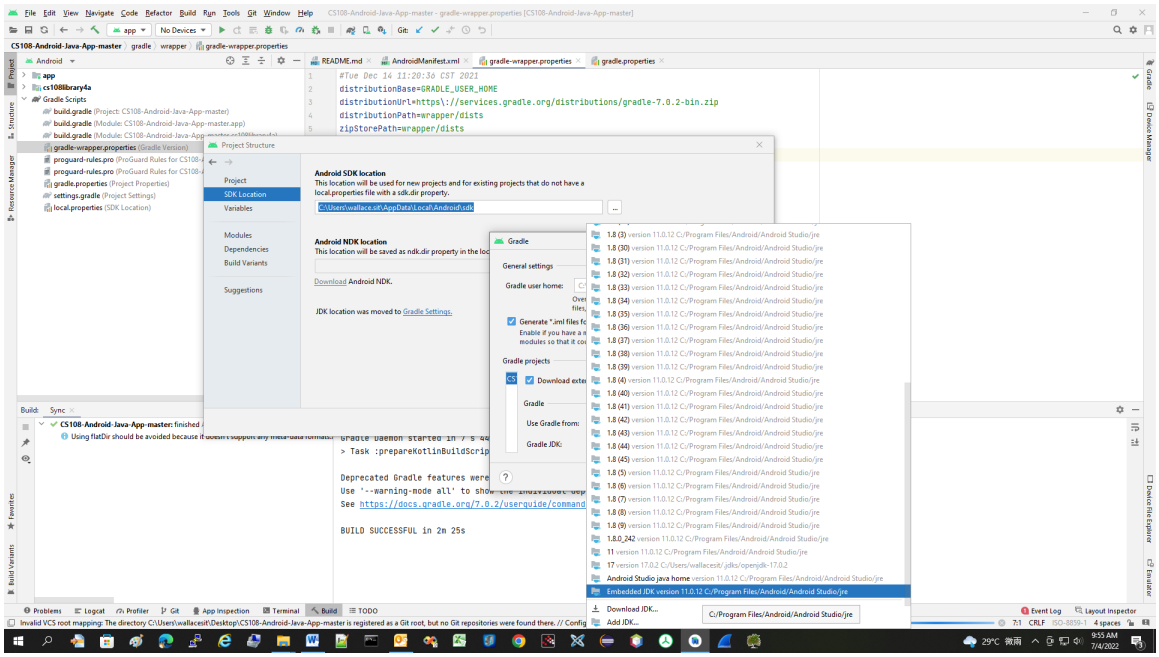
iii. Following pop up may appear. Select “Trust Project”



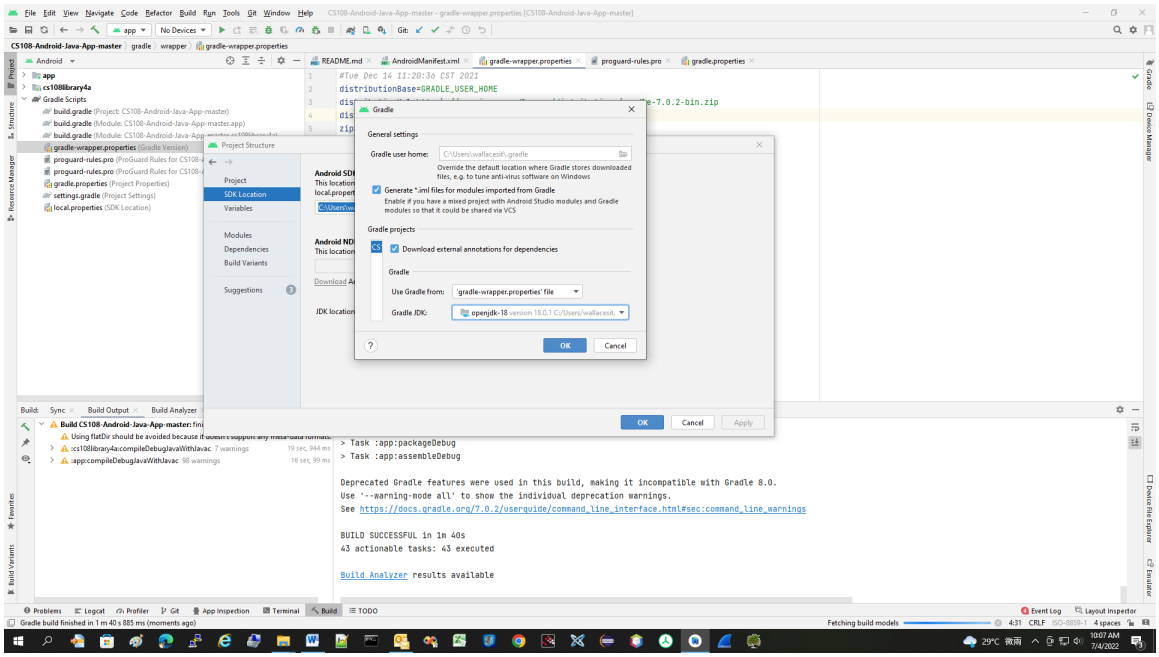
iv. Following pop up may appear. Select “Accept”



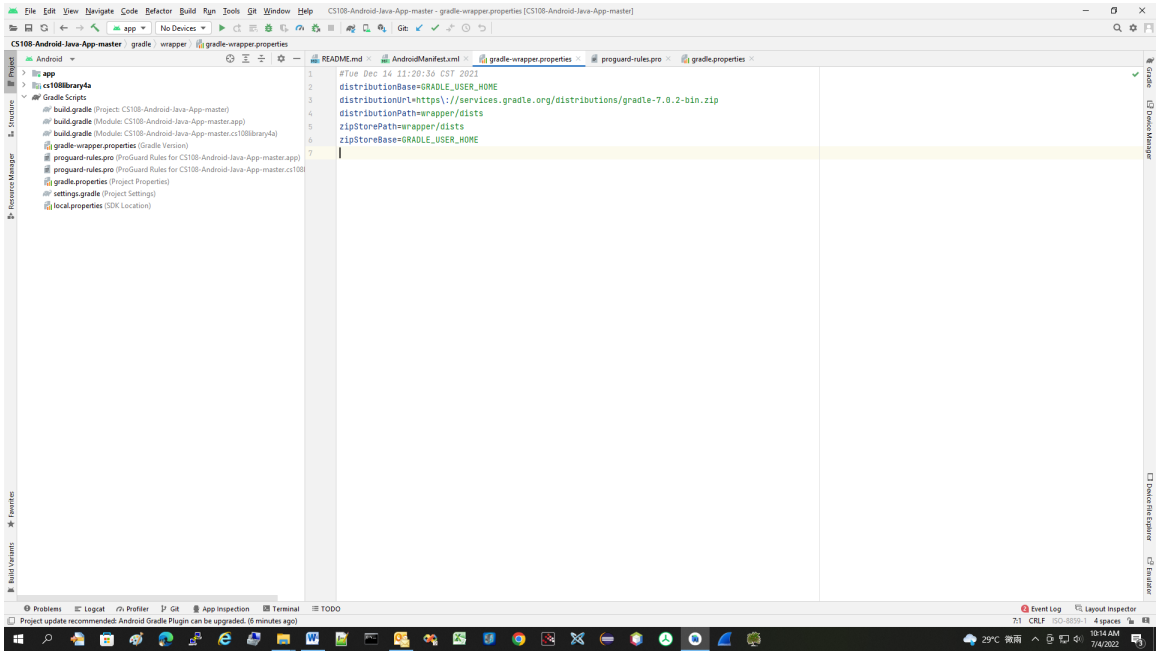
v. You may have error message about “Unsupported Java”. Select “File” -> “Project Structure” -> “SDK Location” -> “Gradle Settings” -> “Gradle JDK”. Select “Android Studio java home” or “Embedded JDK”. Or try “download JDK” to download latest JDK and select the updated JDK.



vi. Select “OK” and “OK” to close the settings



vii. Final display

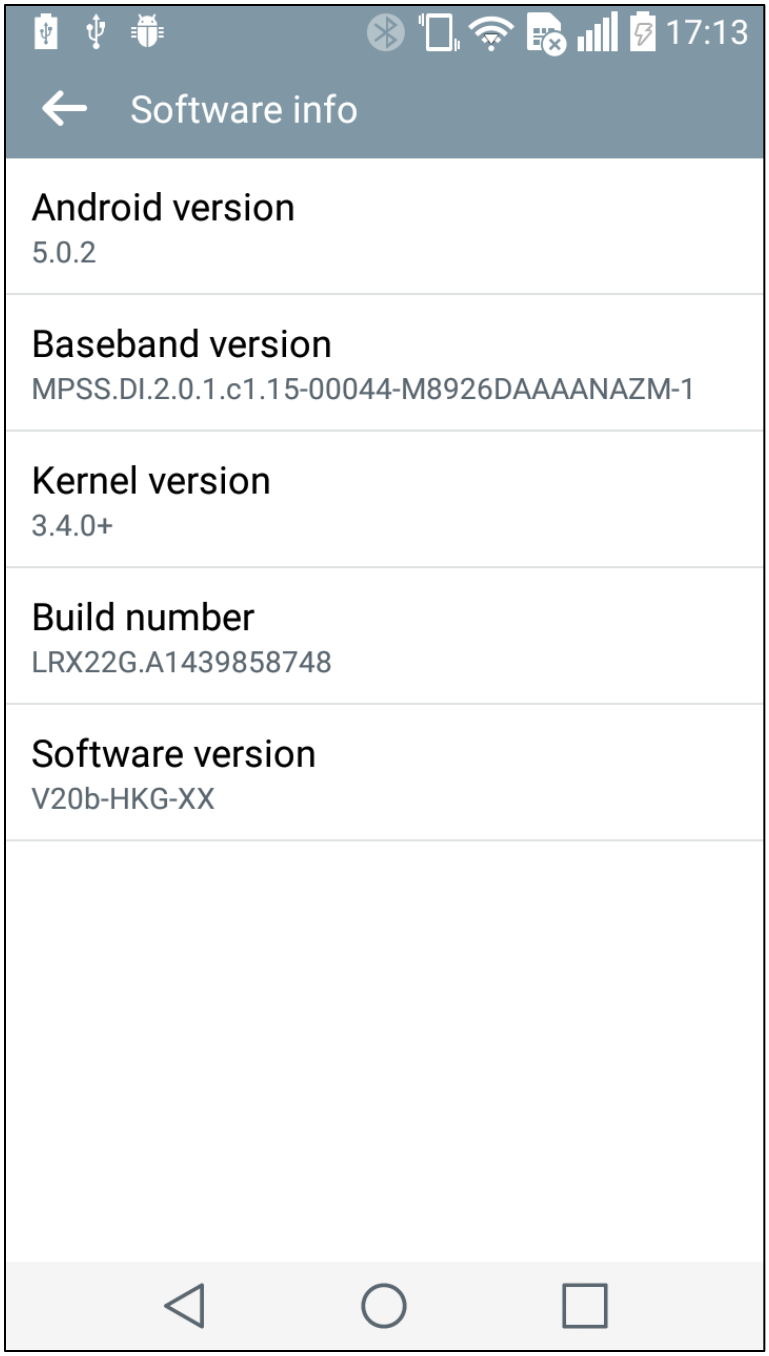


3.3 Debugging Setup

1) Android Debugging setup for Android phone

    i. Enable “Developer options” in android phone

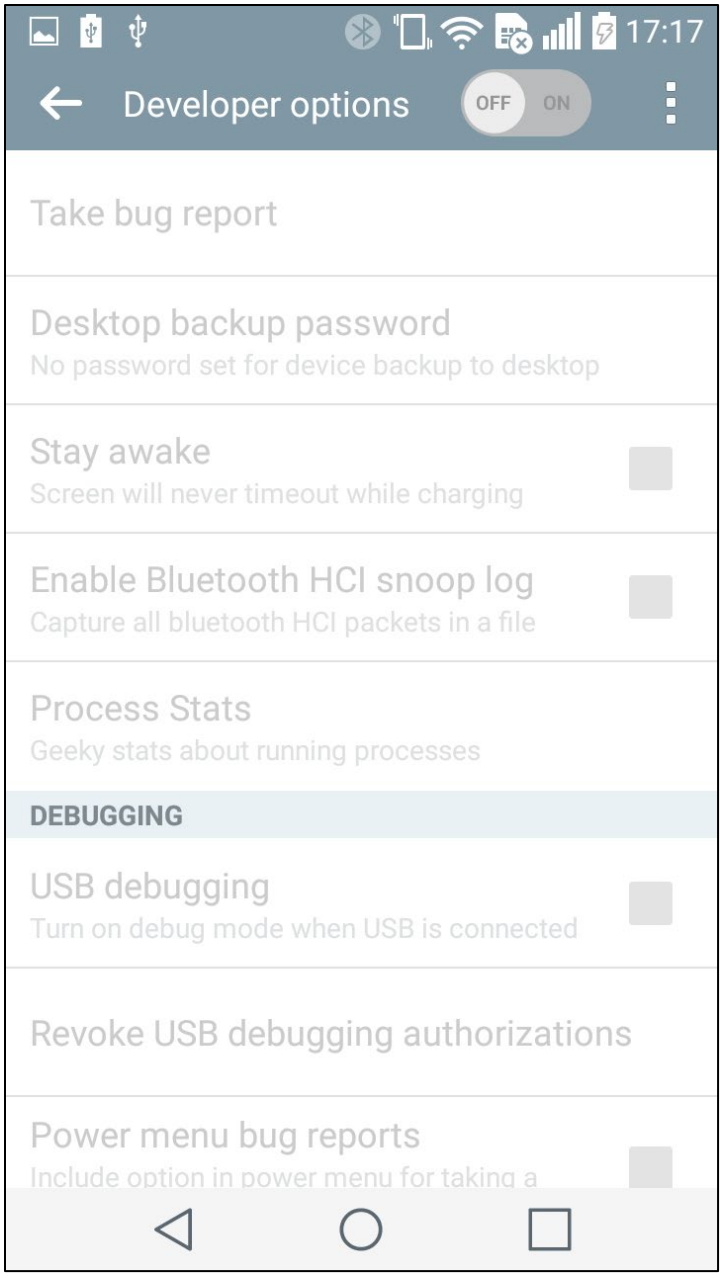
        1. Go to “Setting” app -> “General” tab -> “About Phone” -> “Software Info”



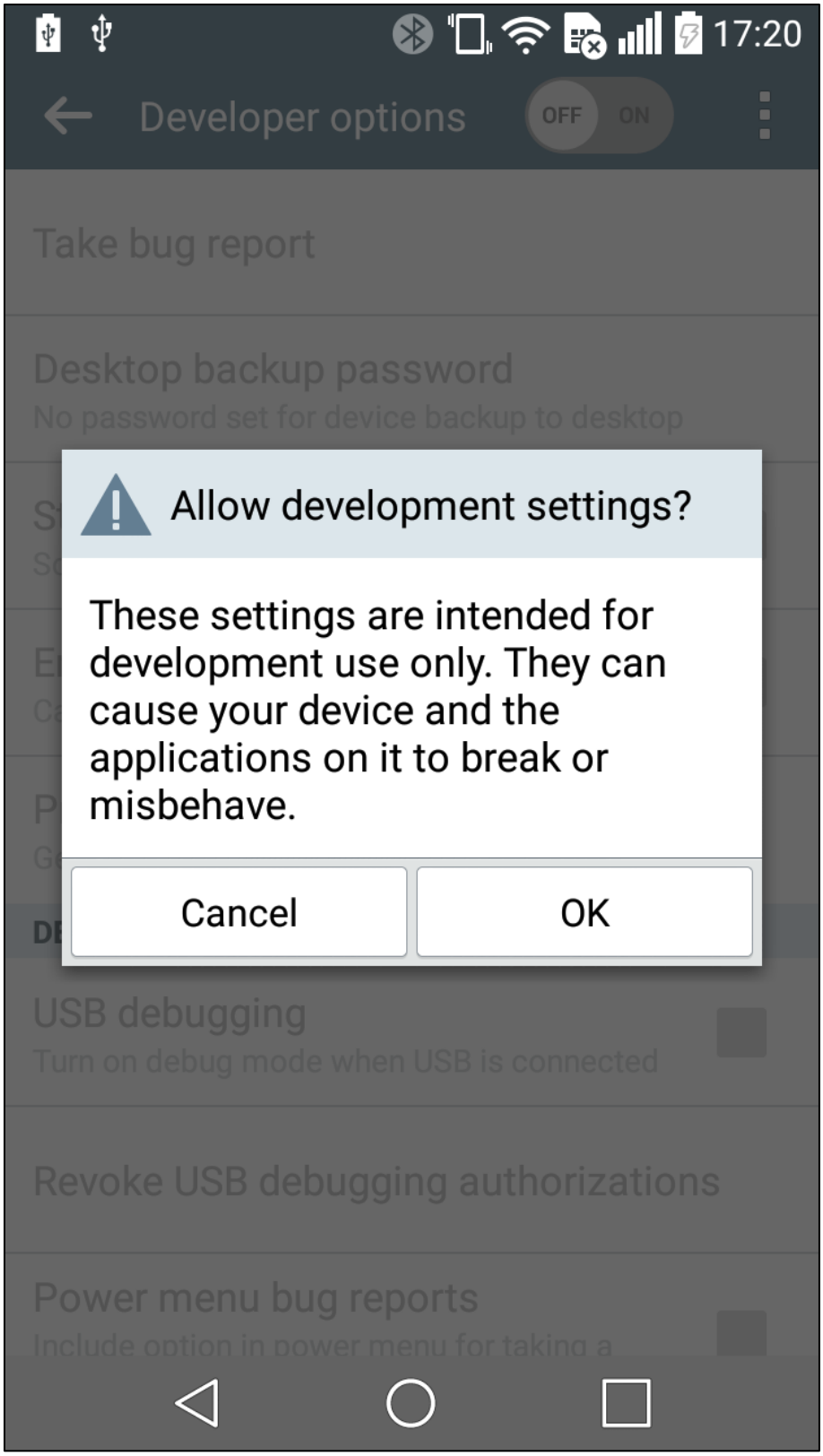
2. Press “Build number” more than 6 times until it shows that the phone is in “developer” mode

ii. Enable USB debugging

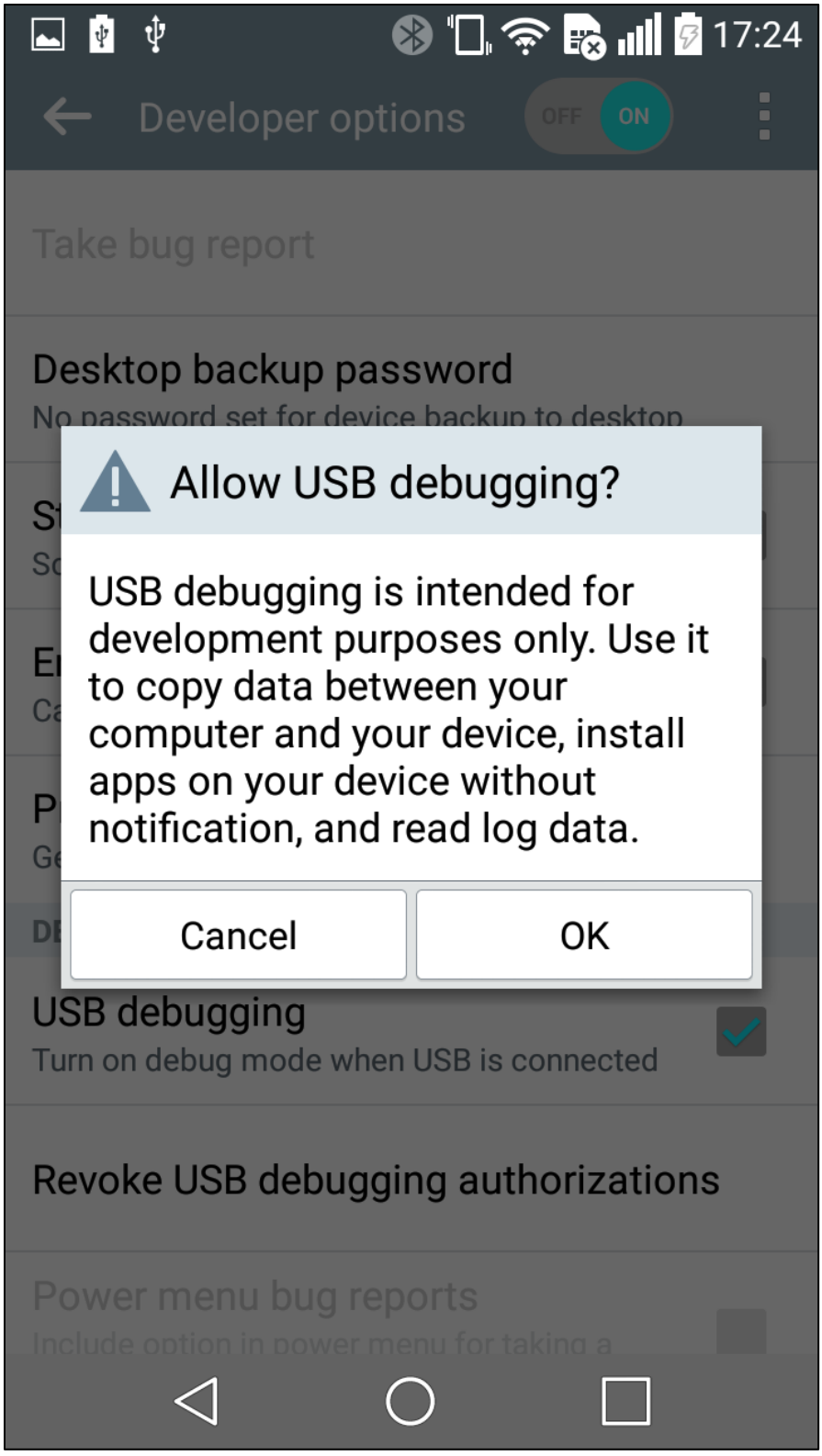
1. Go to “Setting” app -> “General” tab -> “Developer options”



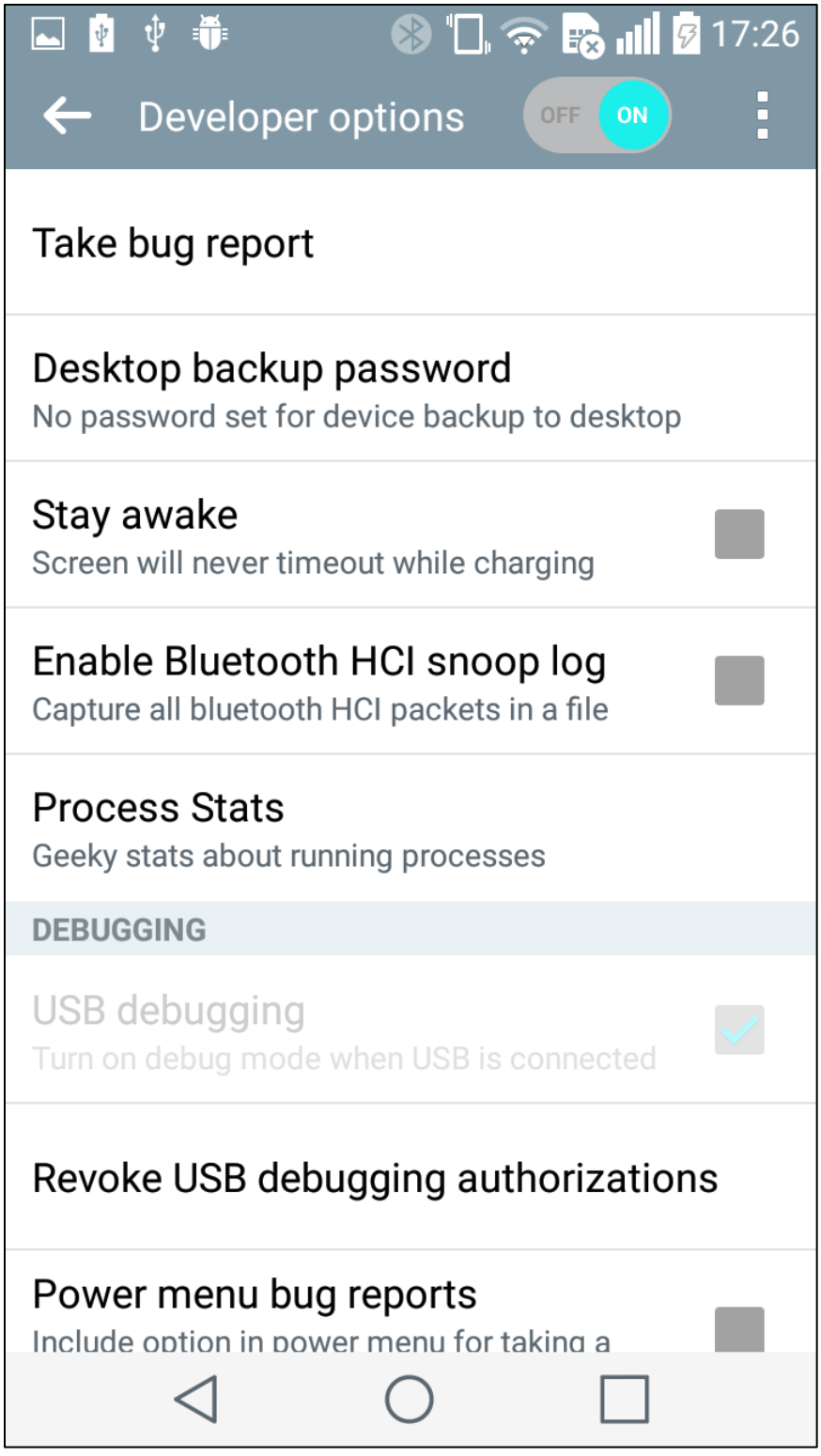
2. Turn on “Developer options” and select “OK” to allow development settings



3. Select “USB debugging” and “OK” to allow USB debugging



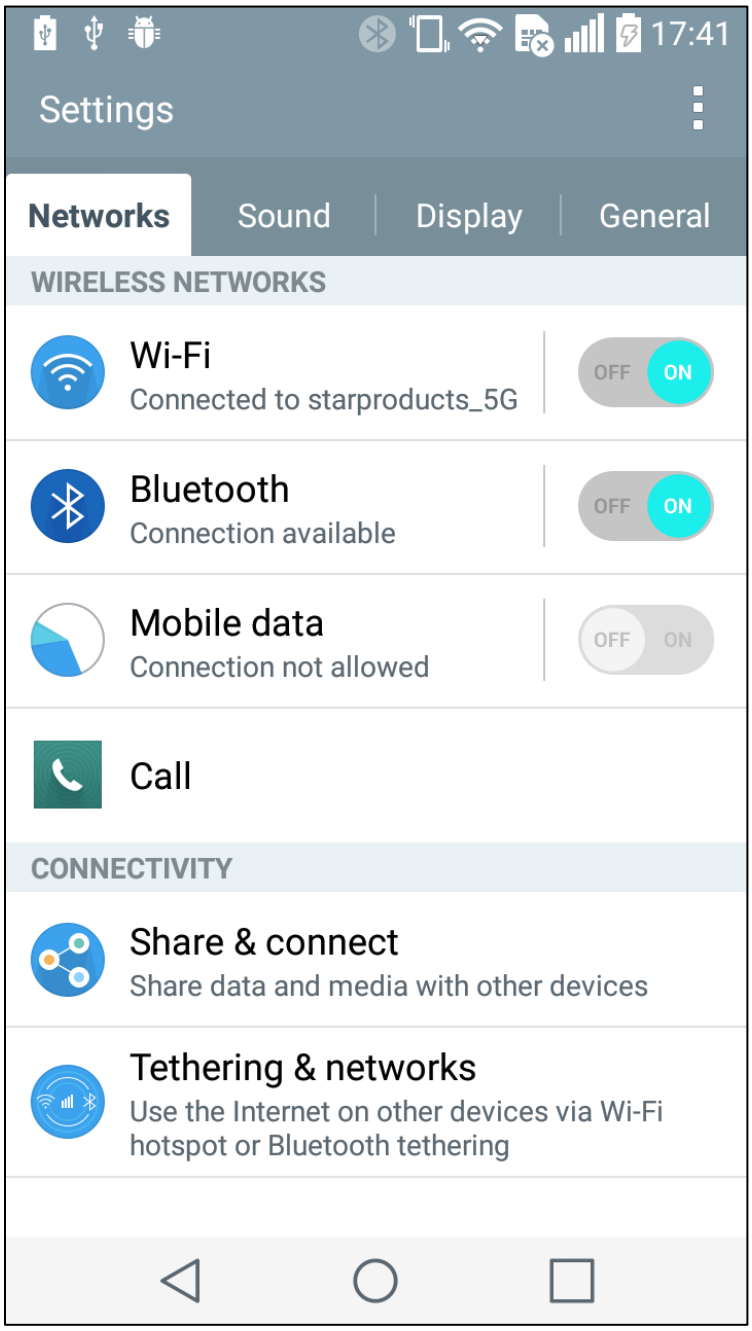
4. Final display which allows USB debugging



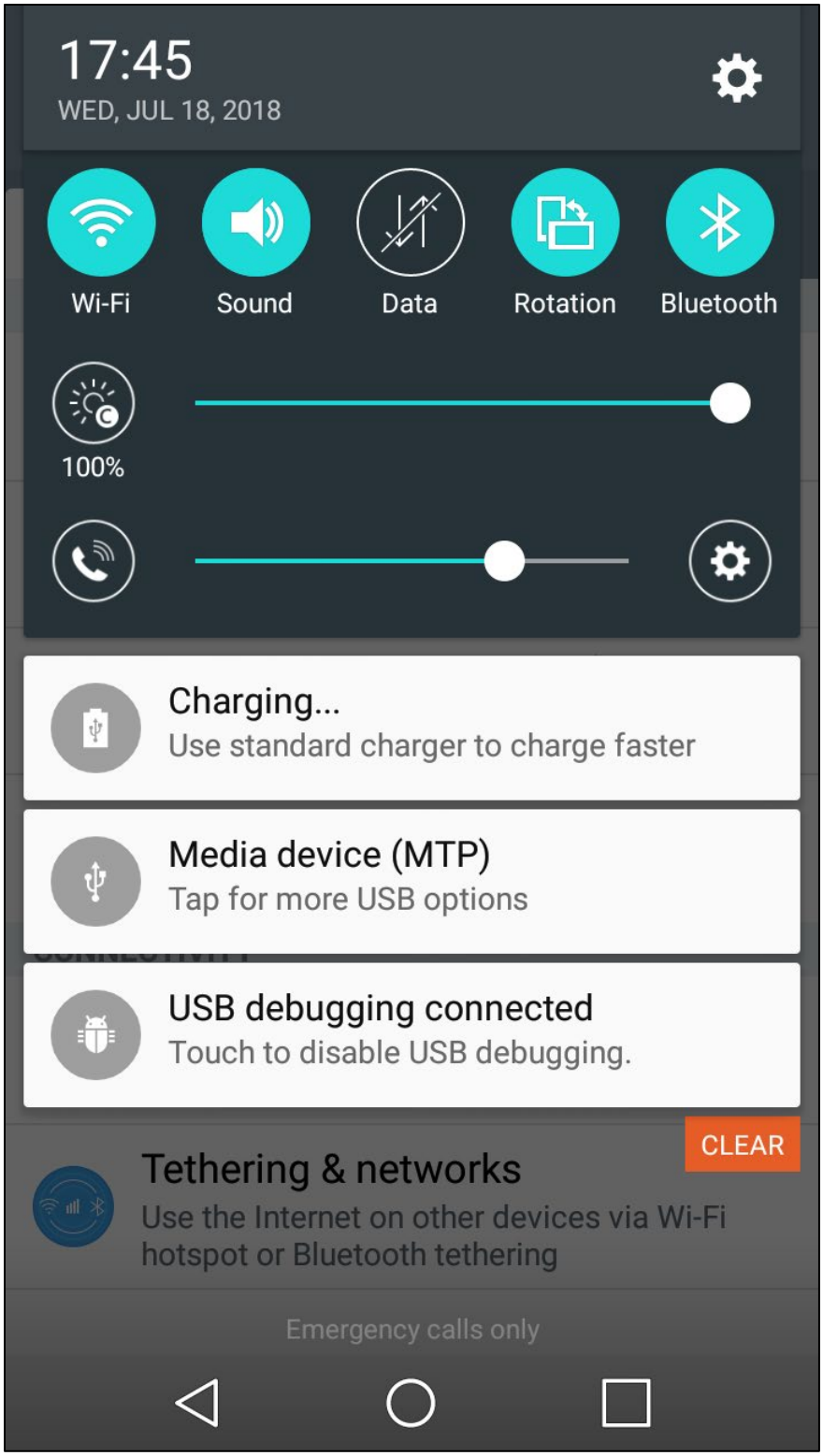
iii. Connect the USB cable between android phone and computer. There should have a  icon on the top besides  icon.

iv. Enable MTP mode for USB PC Connection setting

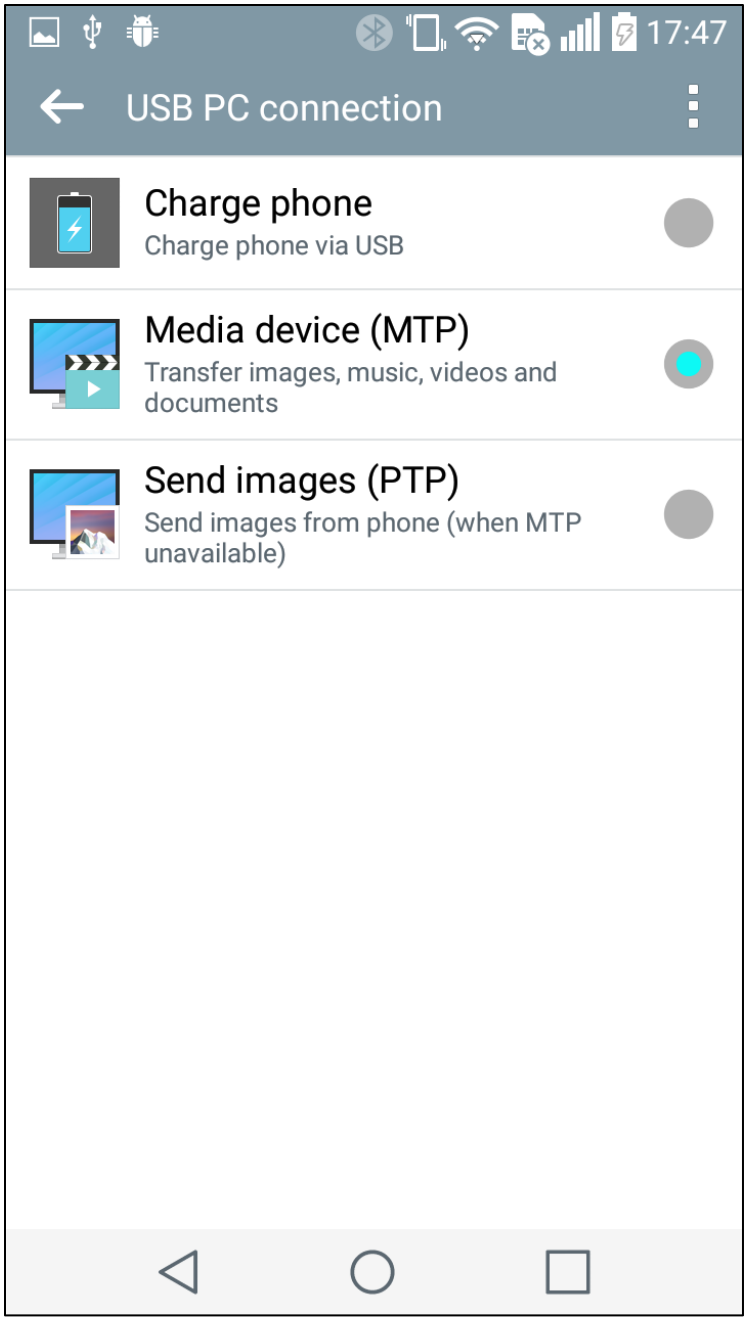
1. Connect the USB cable between android phone and computer



2. Swipe from top line downwards



3. Select “Tap for more USB options”

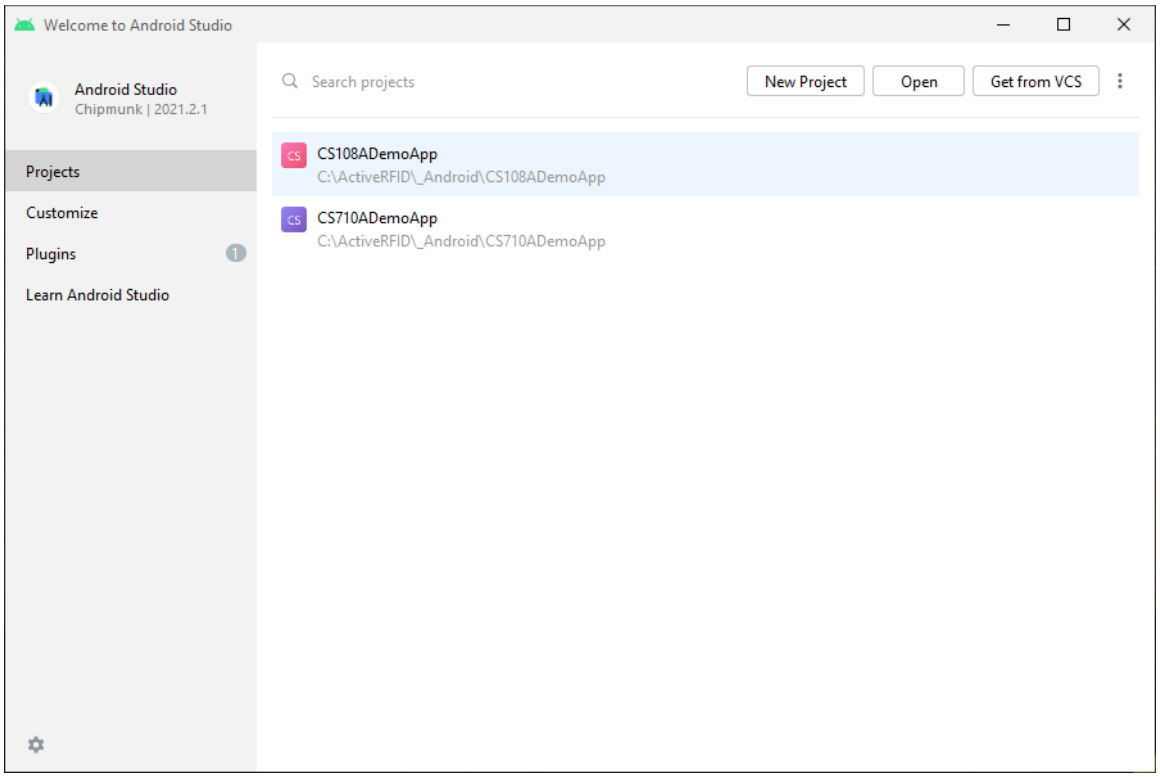


4. Select “Media device (MTP)” for most android phone. Noted that we need to select “Send images(PTP)” in some phone to allow USB debugging.

v. End

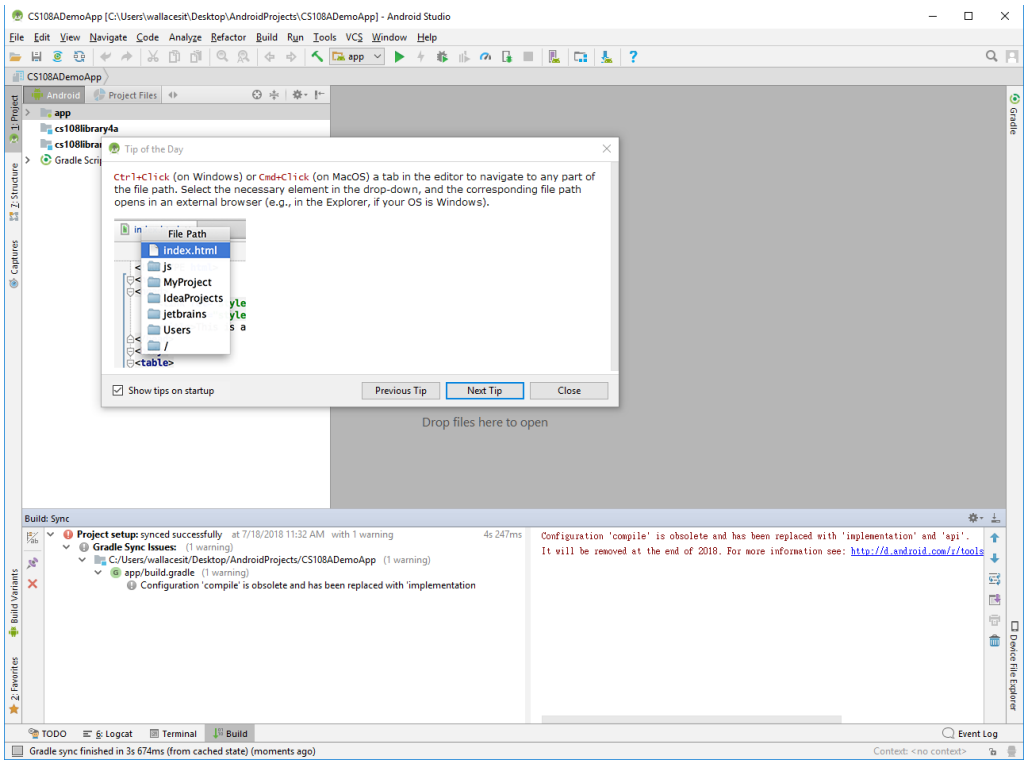
2) Normal Debugging: please connect USB cable from PC to smart phone

i. Open “Android Studio”



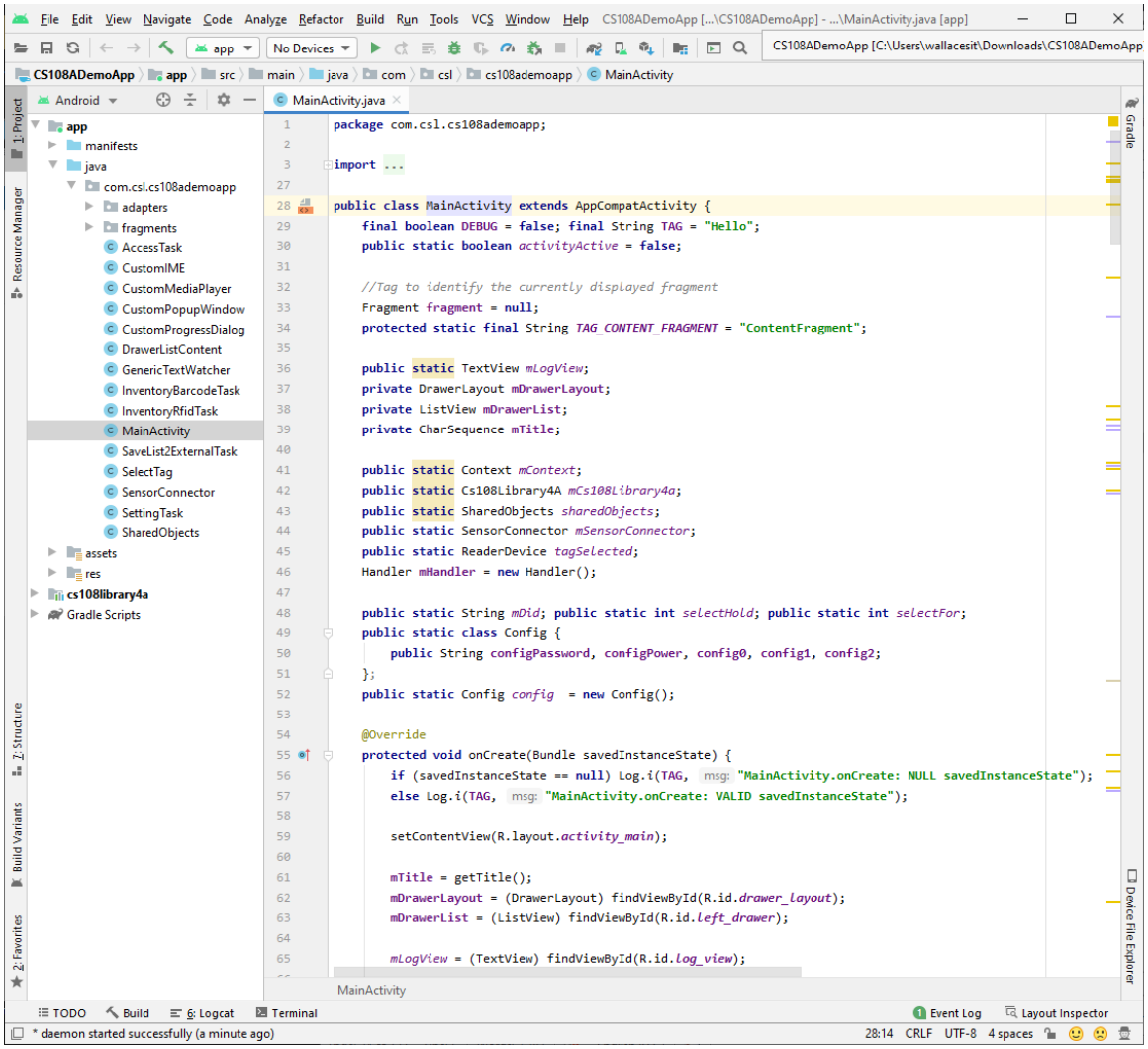
ii. Select the project file on the CS108ADemoApp project on the left. Noted that this step may not be necessary if we do not close the project before previous exit of the android studio.

iii. Select “Close” for the “Tip of the Day”

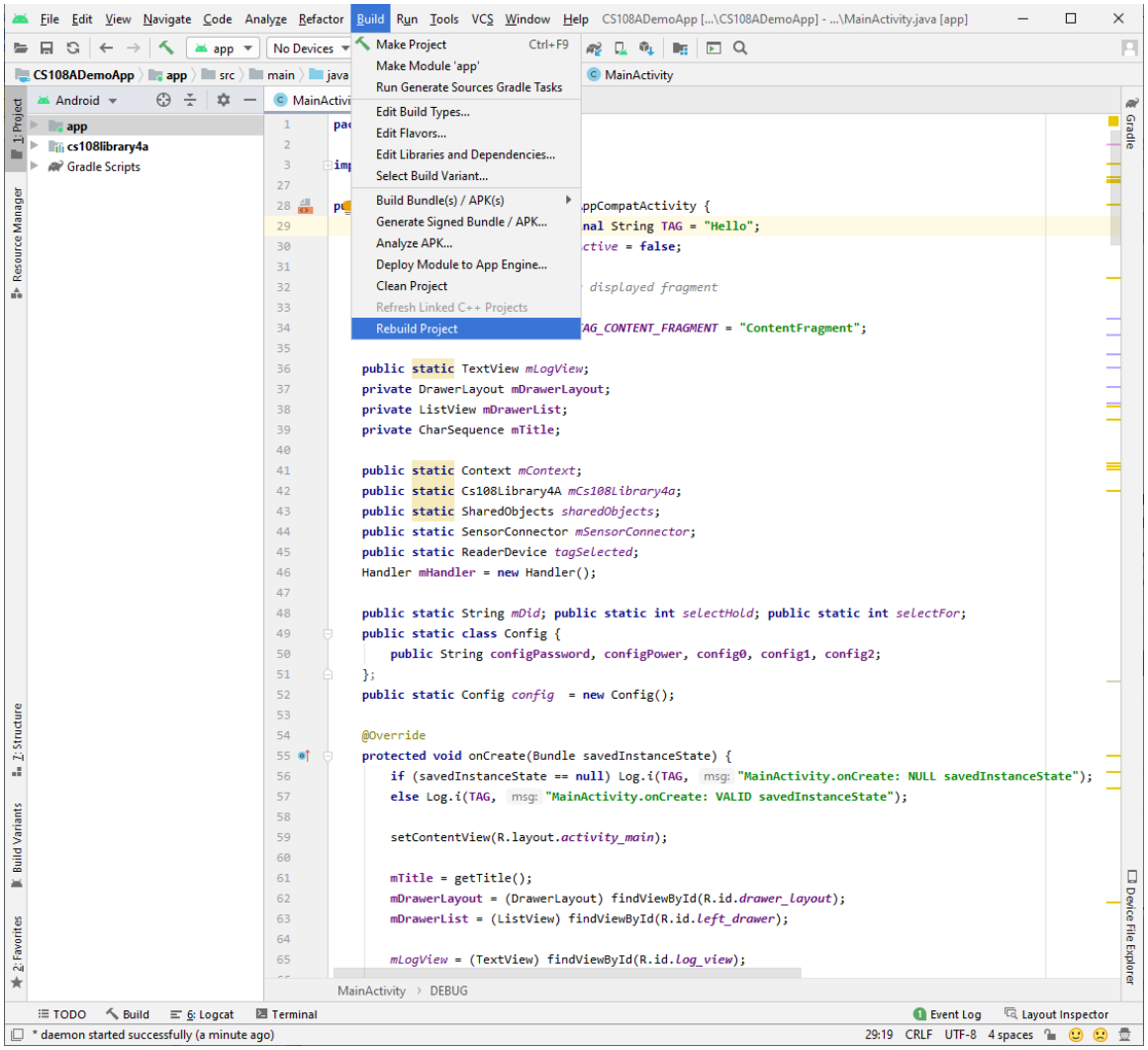


3.4 Modify CS108 Project to be Your Project

1) Modify the project (the files under “app” module) for your own project

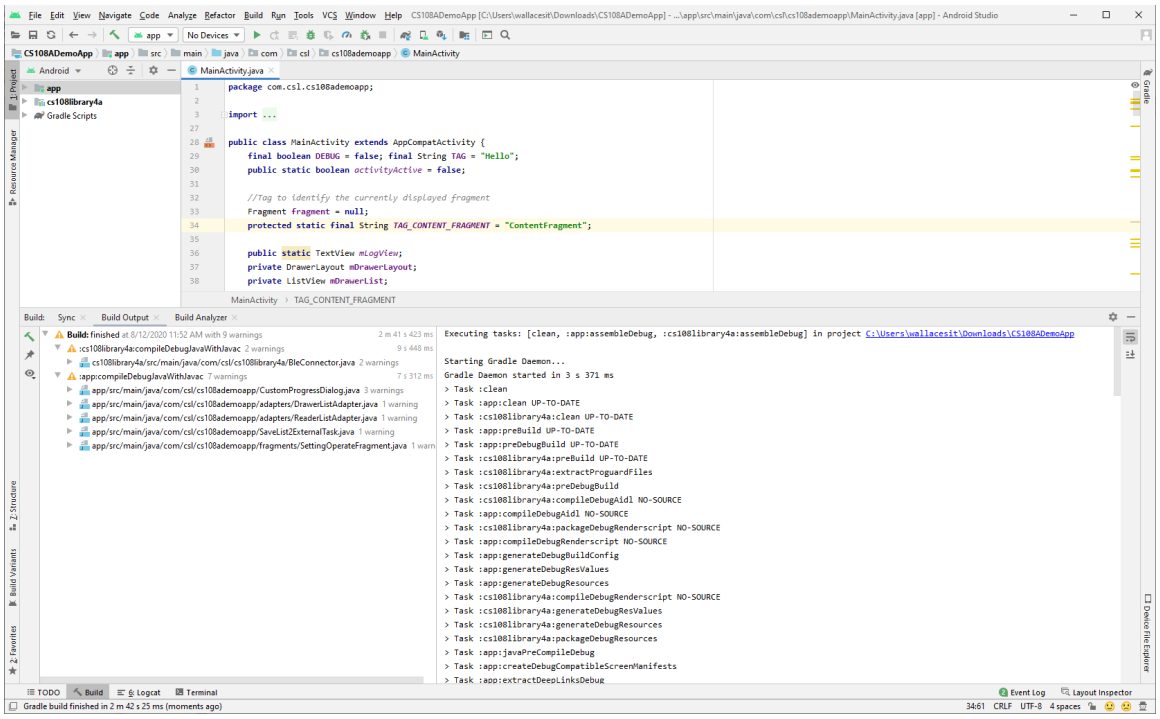


2) Select “Rebuild Project” in the “Build” menu bar of Android Studio. This cleans and compiled the whole project.

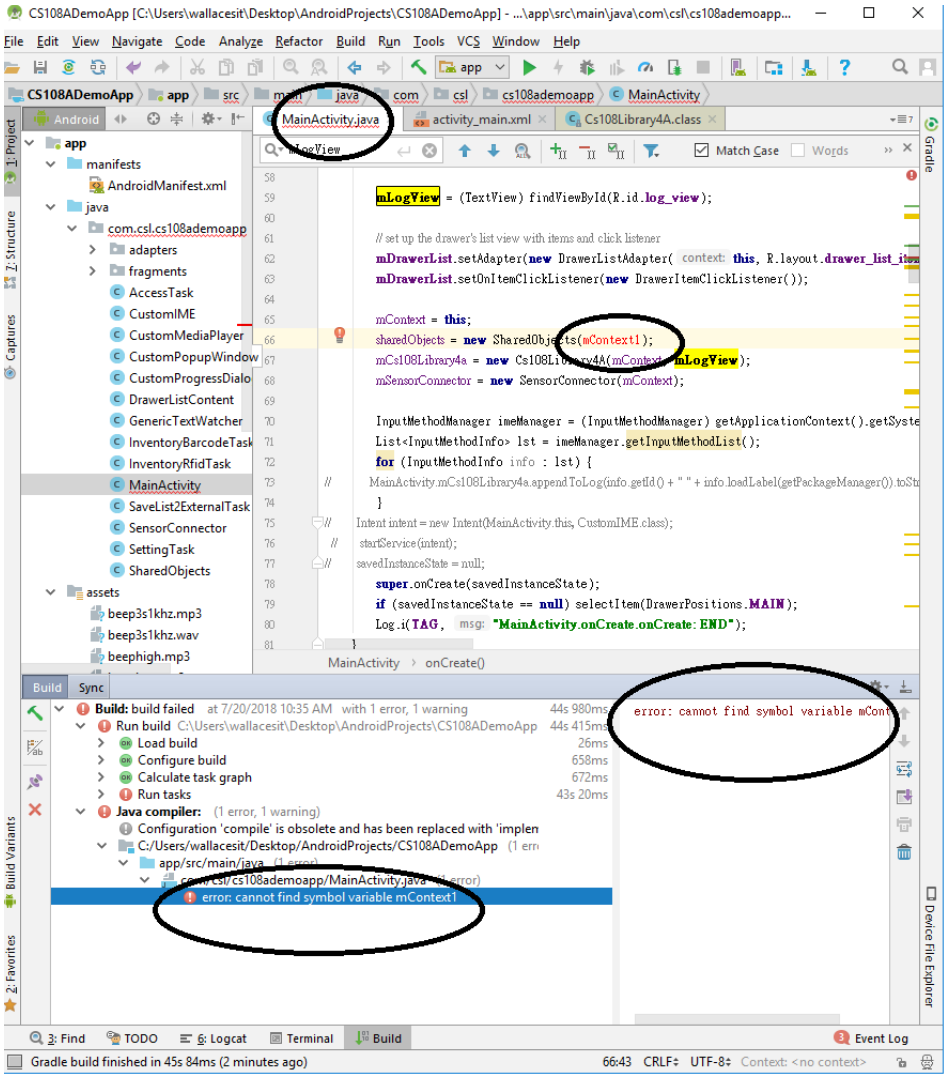


3) Select “Build” tab in the bottom to see if there is error

If no error, it shows as followings.

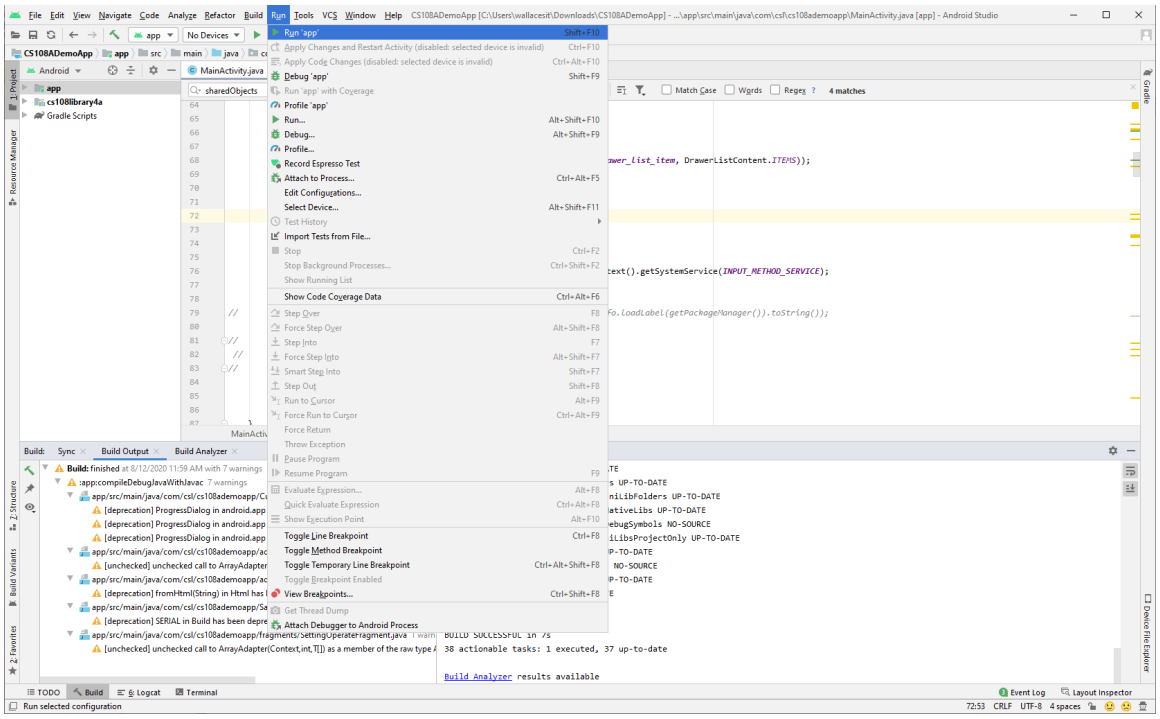


If error, it shows as followings. Select the items with  in the “Build” message window. Android studio should open the appropriate file with error in the source code windows the top right part. It shows the reason of the error in the lower right part of the ‘build’ window. Modify the source code.

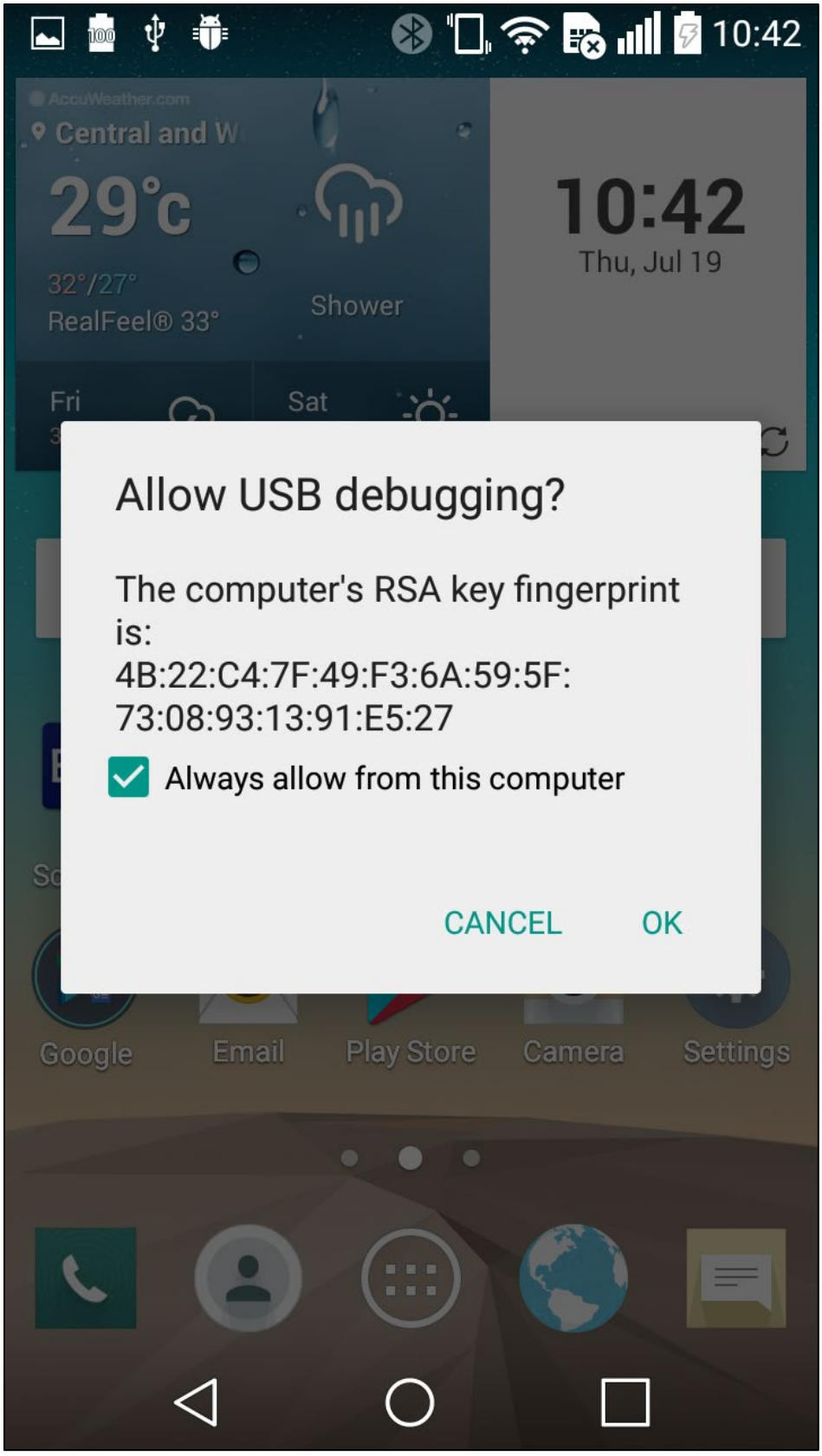


4) Plug in the android phone that has set USB debugging.

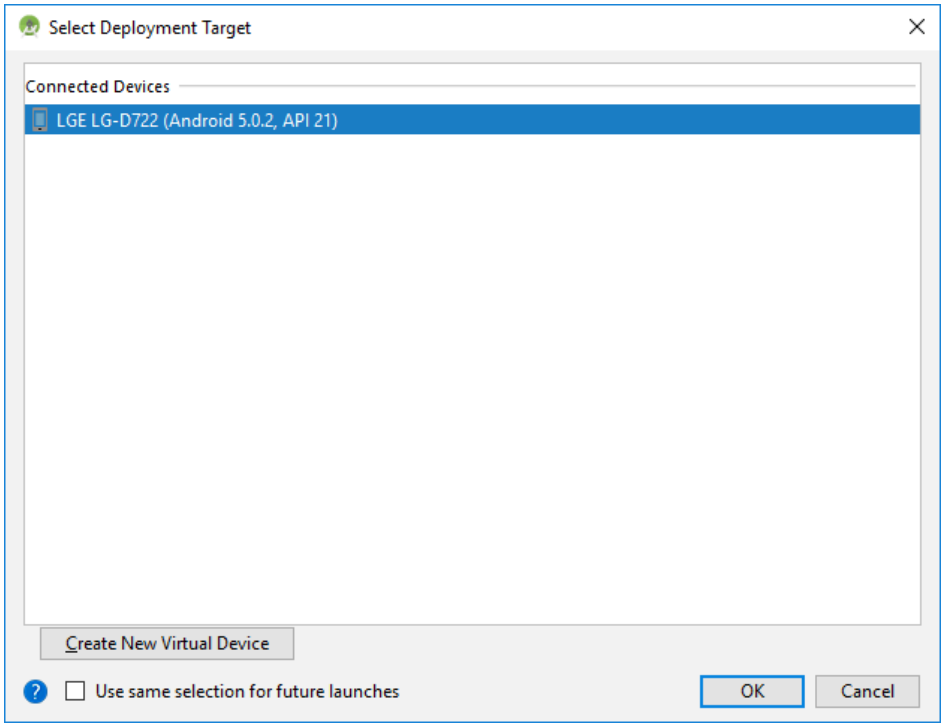
5) Select “Run” in the “Run” menu to download and to install the test app to android phone.



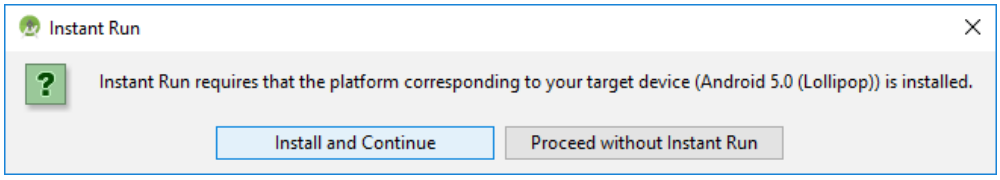
5) For the first time of android debugging, the android phone has following message to request to initialize a data transmission key between android phone and the android studio. Tick the box “Always allow from this computer” and Select OK.

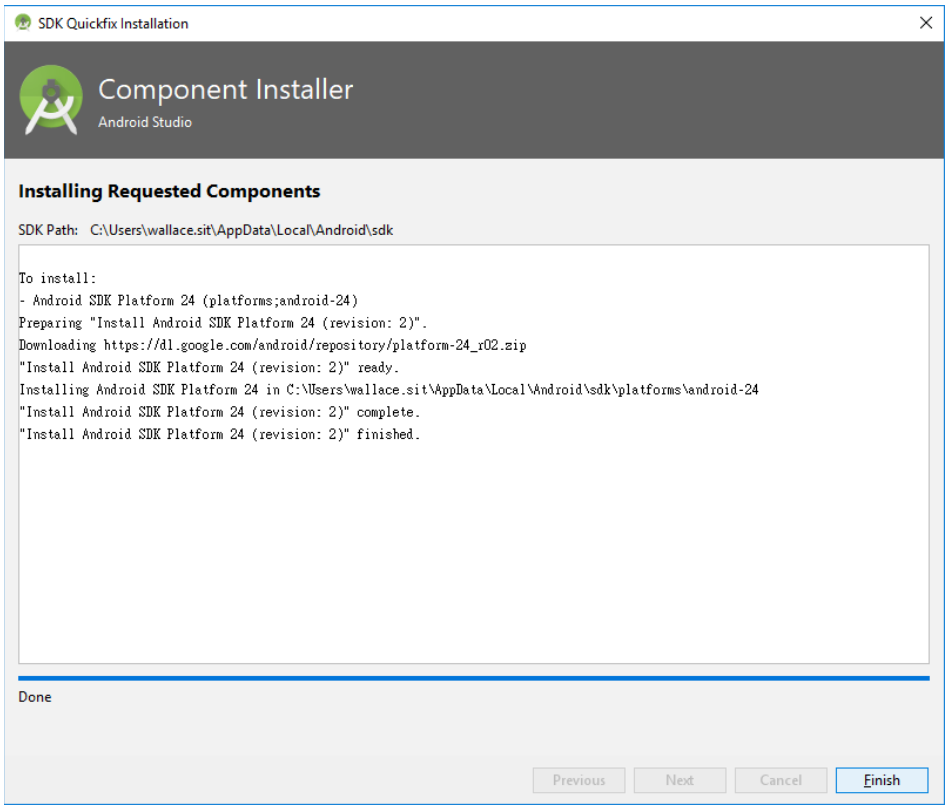


6) In Android Studio, select “OK” in the “Select Deployment Target”

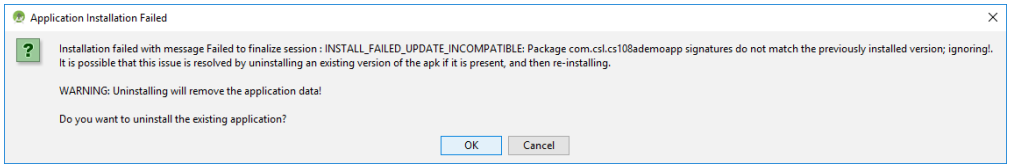


7) For the first time of android debugging, after the Android studio recognizes the target phone device platform, it requests to install appropriate “Run” platform. Select “Install and Continue”. Wait. Then press “Finish”





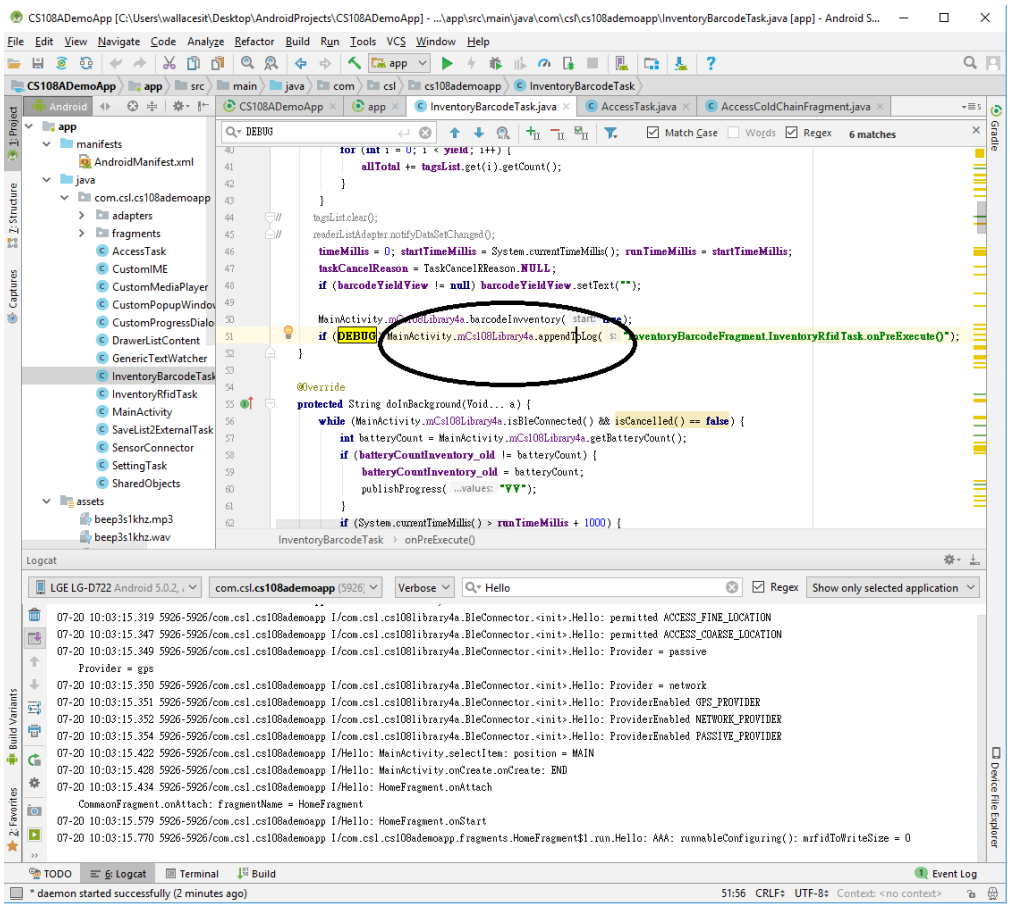
8) For the some android phone or for the first time of debugging, it may have following message to request to uninstall the previous version of app having the same name. Select “OK” to continue



9) The previous apps having same name should be uninstalled. The new apps should be installed and executed with the following display in the android phone.

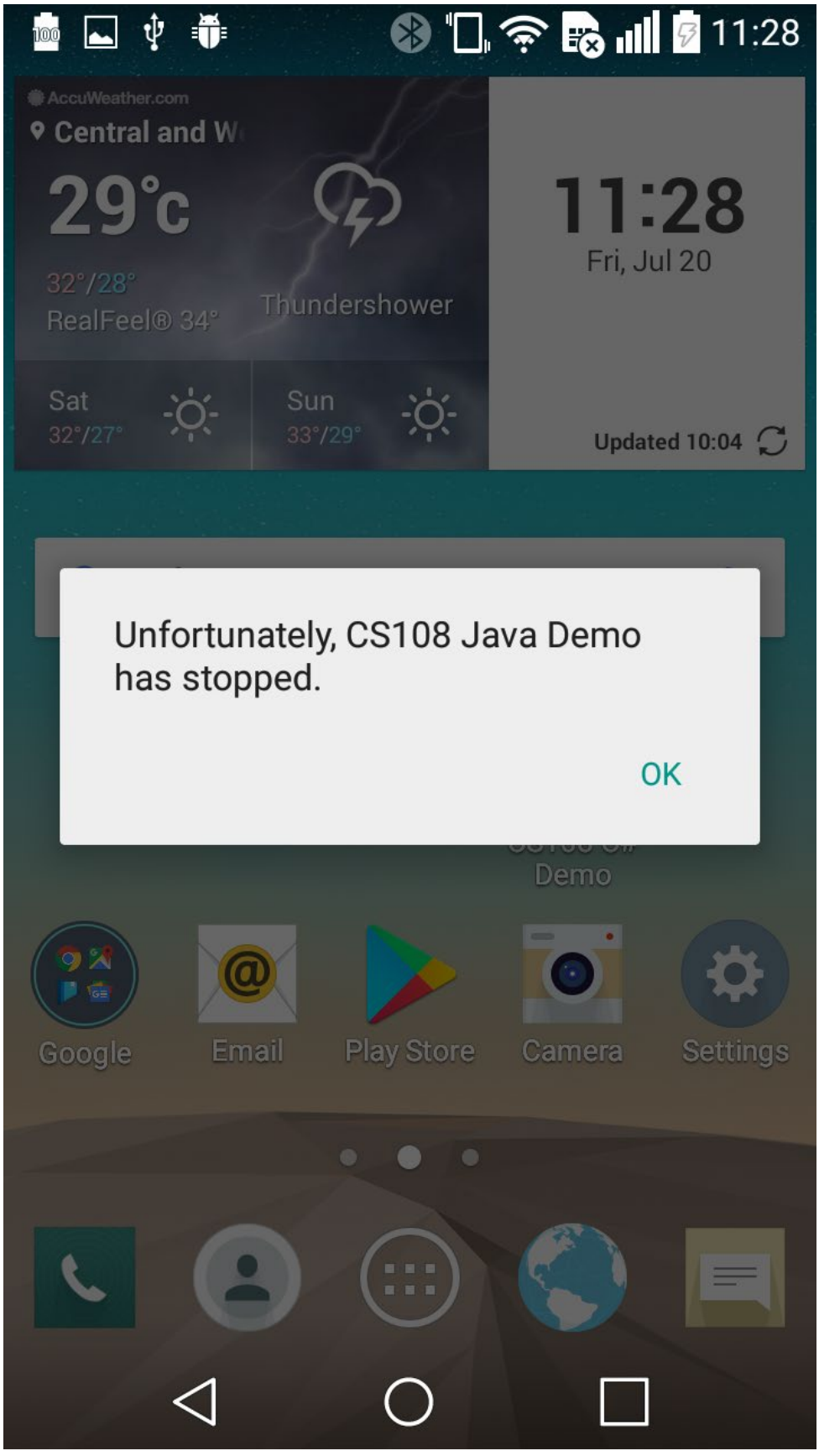
10) For the logical software error, we need some debug message to debug the problem. We may place the debug message by using the android command Log.i("Hello", "test debug message") or the cs108library4a command appendToLog("test debug message").

    Select "LogCat" tab in the bottom of Android Studio to display the debug message. Select "Verbose" with appropriate filter word, such as "Hello" which is the default TAG of the Log command of the cs108library4a.

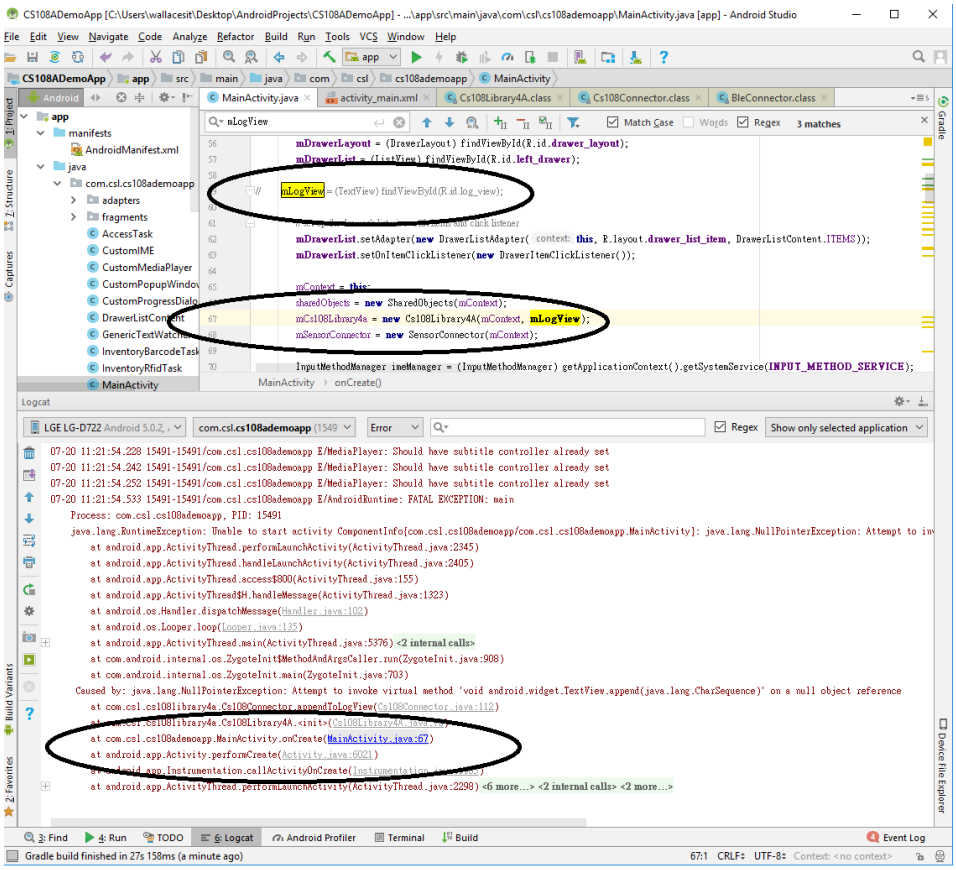


11) For software clash and reset problem, we may use Android studio to debug. Connect the phone with usb. Select "LogCat" tab in the bottom of Android Studio to display the debug message. Select "Error" to see possible error messages especially when the app clashes. No filter is needed. Select Run in android studio menu to download and execute the app. Try repeat the clash.

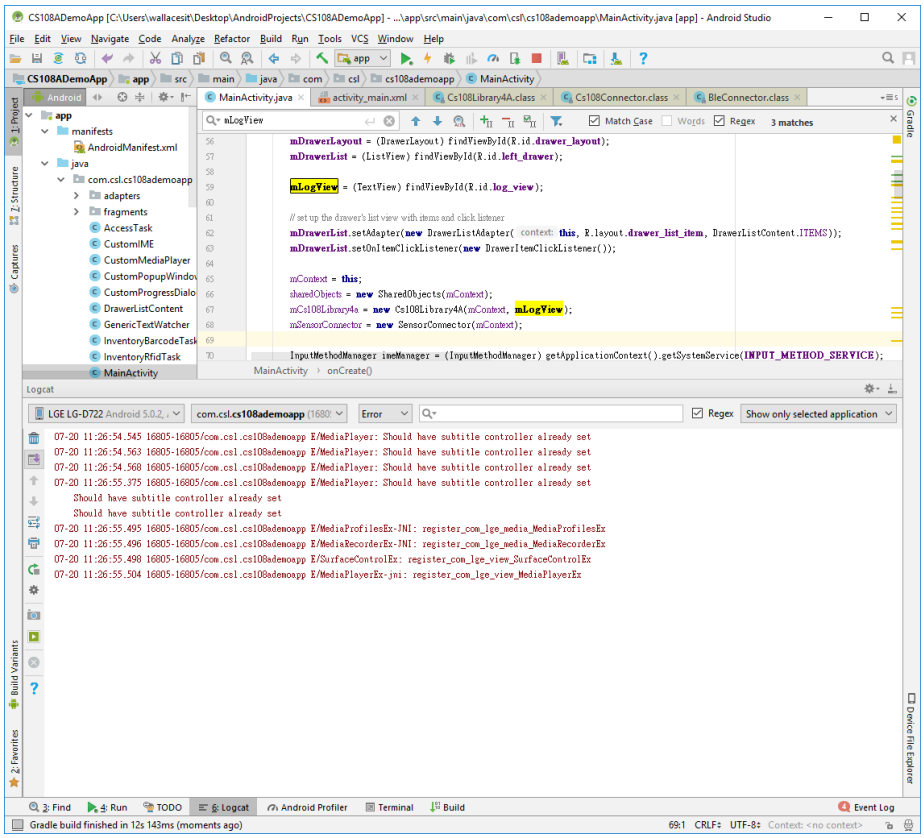
    If the application crashes, the phone app has display like the following.



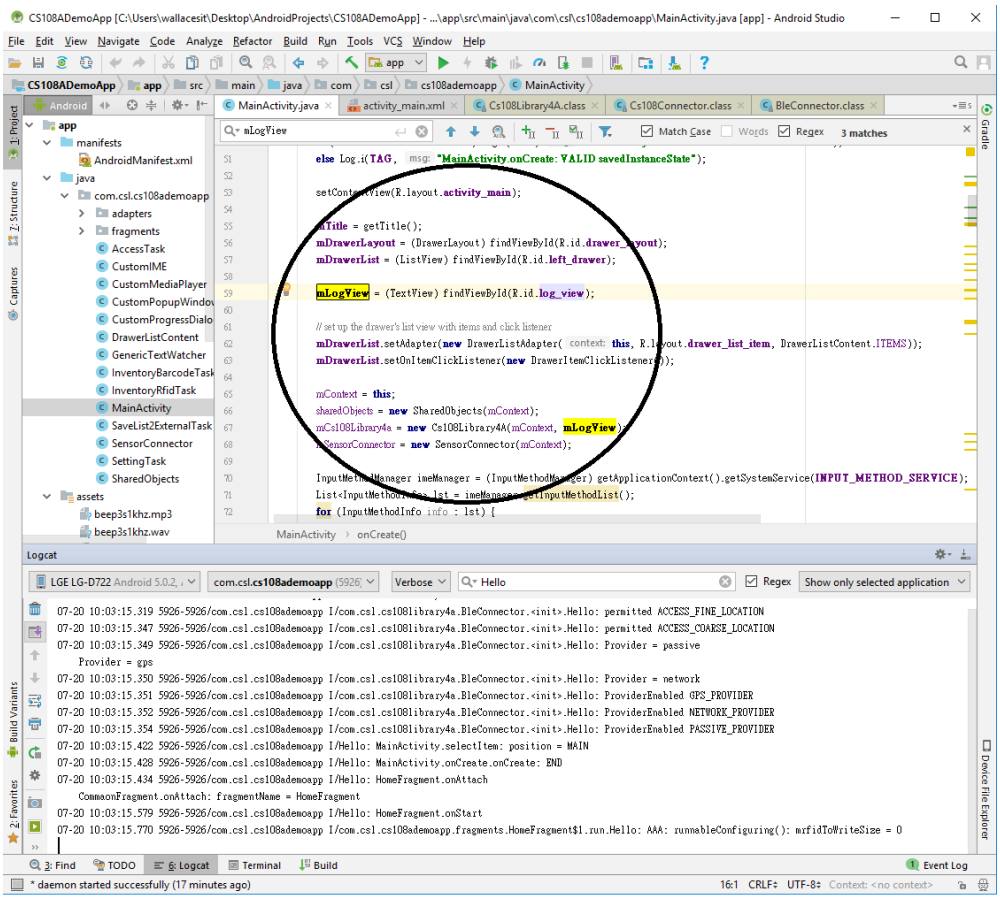
If error, android studio displays like following. Tick the Blue line in the LogCat window to go to the problem line of the problem file in the upper right part of the android studio.



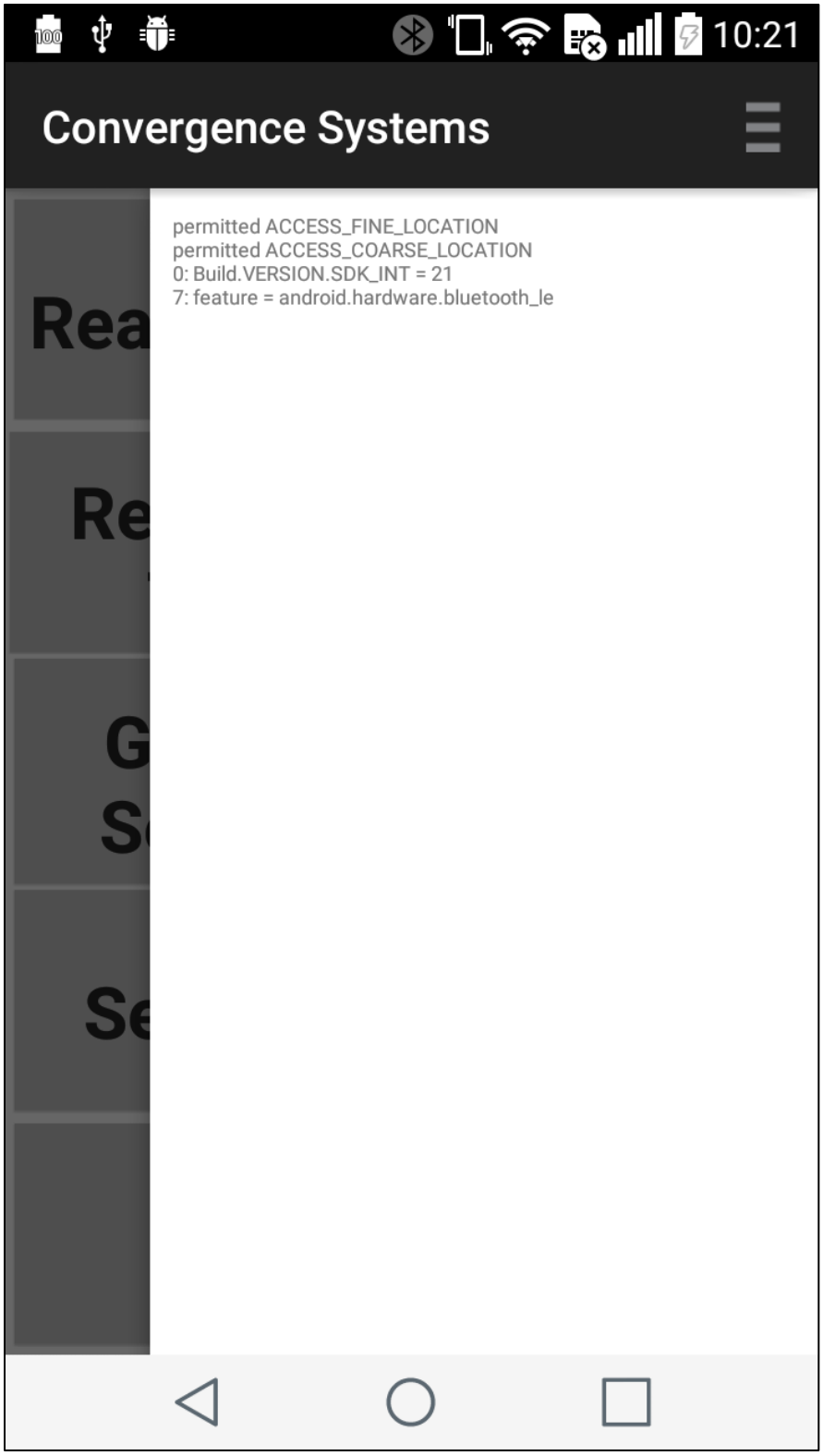
If no error, android studio displays like following.



12) Debug message without Android Studio. Sometimes problem cannot be repeated when the phone connects to android studio. The DemoApp adds ListView class mLogView in the right DrawerLayout. We can add the debug message by mLogView.append("Test debug message"); The mLogView is also used by cs108library4a class.



The debug message is seen by swiping the right edge of the apps.



13) Modify and debug the test project. Repeat above.

14) End

3) Demo App Architecture

The demo app has three modules: app, cs108library4a and Gradle

A. ‘app’: the modules contains the UI related classes and methods. It is grouped as manifests, java, assets and resources

i. ‘manifests’: it has AndroidManifest.xml which defines the applications and activities, user-permission used in the ‘app’ module.

ii. ‘java’: it contains the java UI related source files. It is grouped as adapters, fragments and shared.

1. ‘adapters’: it contains the different adapters for ViewPager, or ListView Android UI components used in some UI pages.

2. ‘fragments’: it contains the definition of different UI pages

3. shared: it is located directory under ‘java’ directory. it includes ‘AccessTask’, ‘CustomIME’, CustomMediaPlayer,… They are common UI related tasks called by several UI pages.

4. MainActivity.java: it is the starting point of the Demo app.

iii. ‘assets’: it contains the audio files used by the UI pages to output sound

iv. ‘res’: resource group has the UI data used by the UI pages. It is grouped as drawable, layout, menu, values and xml.

1. Drawable: it contains the pictures for the UI pages

2. Layout: it contains the layout definition of different UI components in different UI pages.

3. Menu: it contains the layout definition of different menu components used in different UI pages

4. Values: it contains colors, dimens, strings and styles used in different UI pages.

5. Xml: it is not used now.

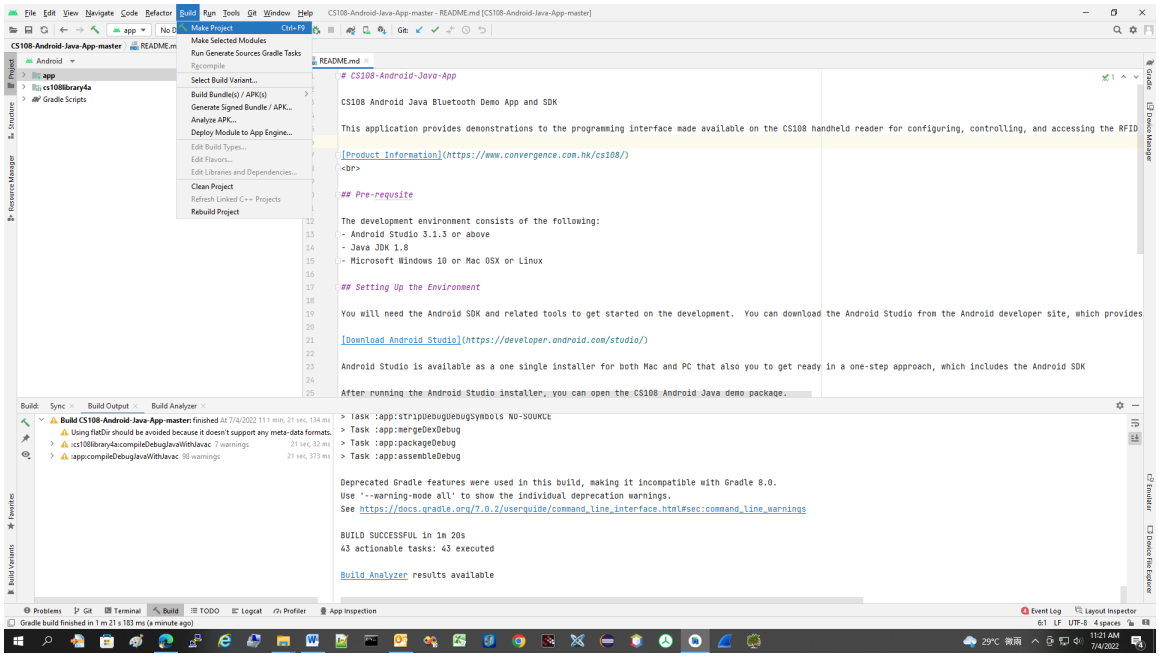
B. ‘cs108library4a’: the library modules contains non-UI related classes and methods. It is also group under manifests, java and resouces. ‘manifests’ has AndroidManifest.xml which defines the classes, user-permission used in the module. ‘java’ contains the related source codes. There are only 7 files. ‘res’ has the data used by the library modules. There are only useful file -- popup.xml and strings.xml.

C. ‘Gradle Scripts’: it contains some global properties with .gradle files. Those properties includes required sdk versions, version name,…..

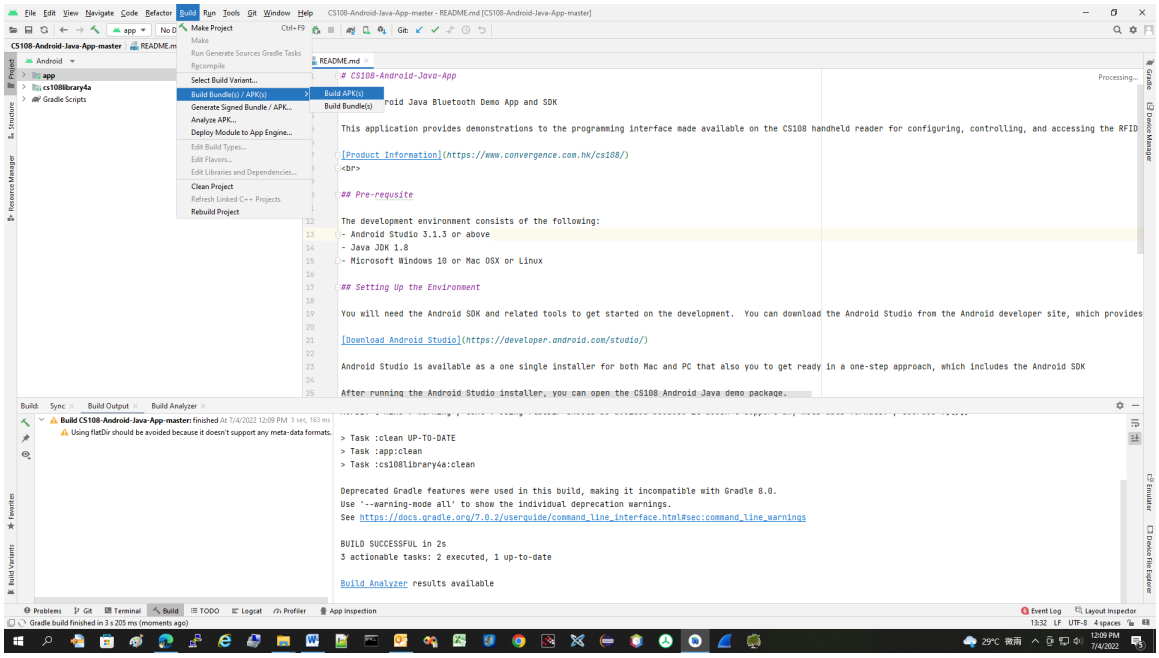
4) Generate apk for direct download and installation

A. Source file preparation – Change the versionName value within build.gradle for the Module app so that new app version can be displayed for new generated apps.

B. Select “build” -> ‘Make Project’ in Android Studio

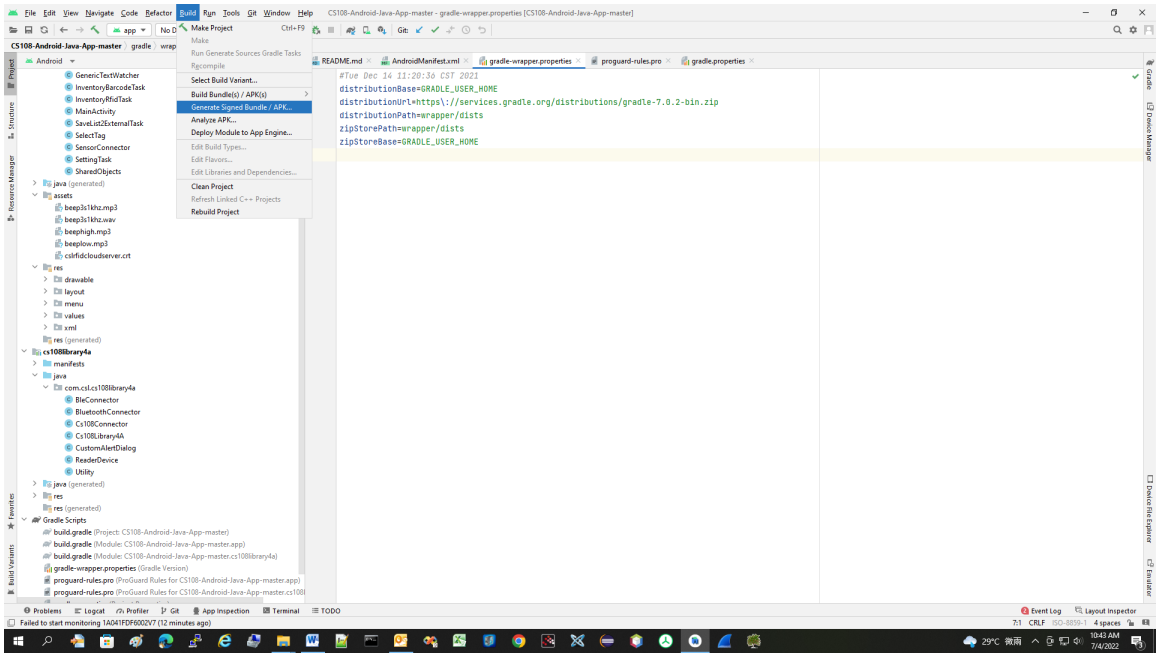


Or select “build” -> “build bundle/apk” -> “build apk”

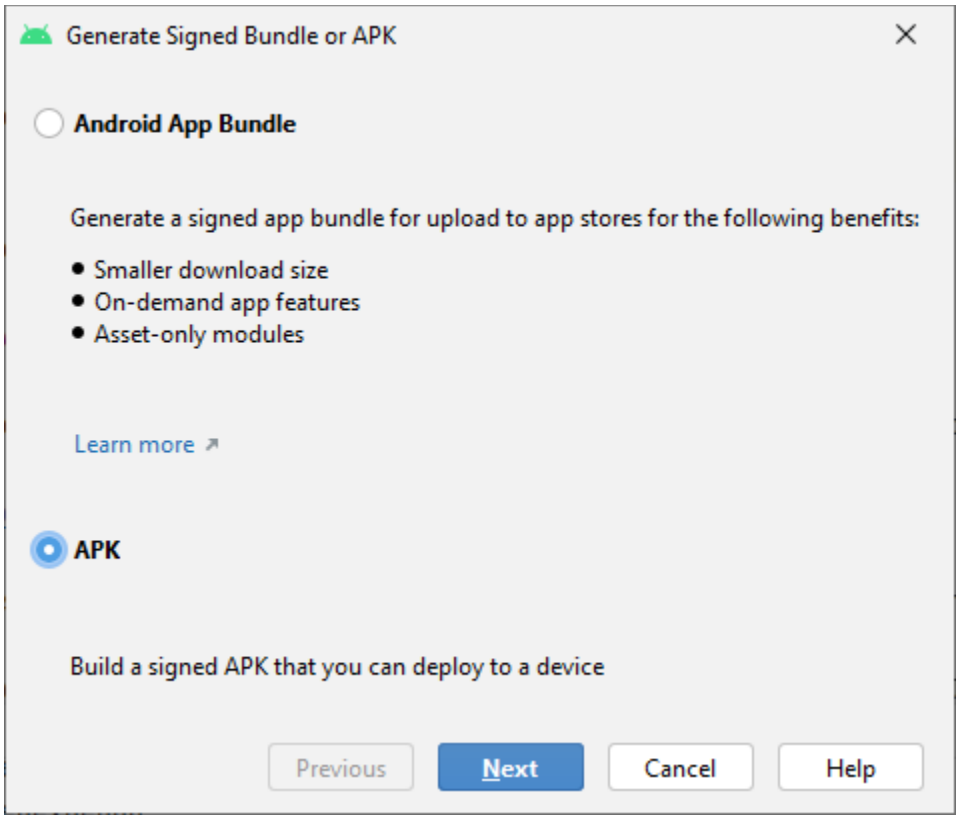


If successful, the file app-debug.apk is in app\build\outputs\apk\debug

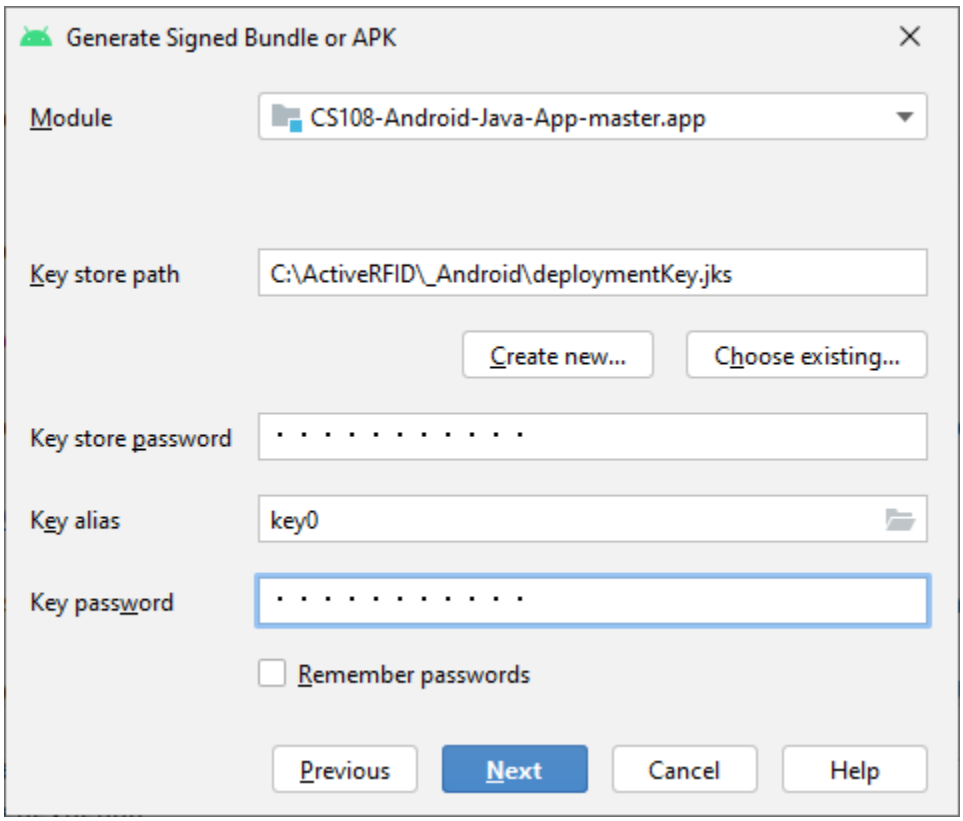
Or Select “build” -> “generate signed bundle/apk”



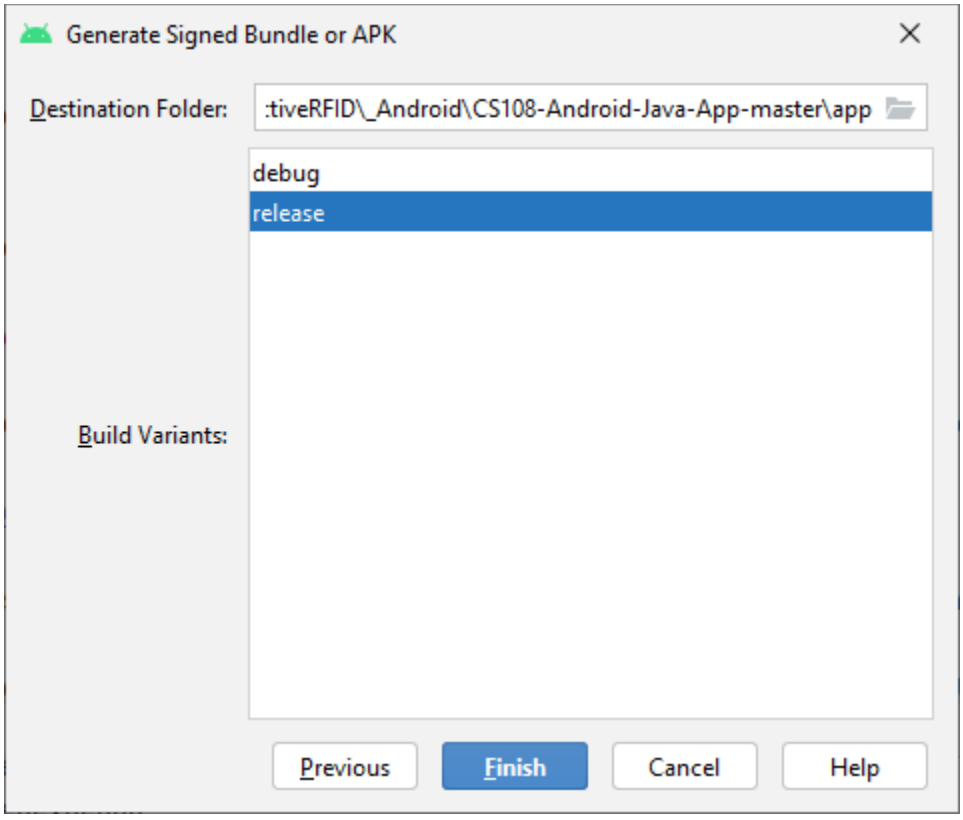
Then Select “apk” and then “next”



Then input the key location, passwords and alias, then “next”



Then select “debug” or “release” and “Finish”



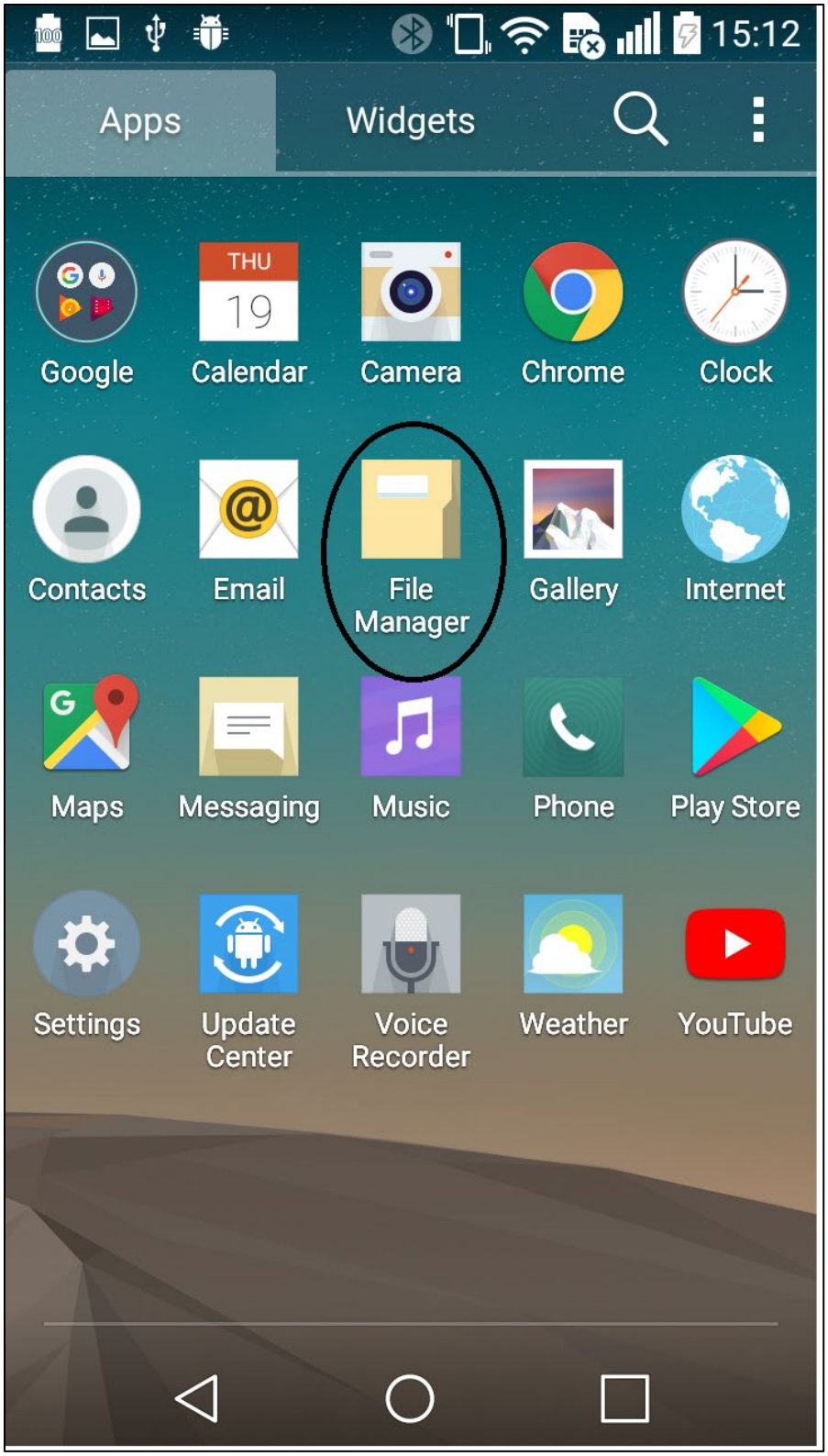
If successful and debug file is selected, the signed file app-debug.apk is located in app\debug. If successful and release file is selected, the signed file app-release.apk is located in app\release.

C. File inventory: Rename the app-debug.apk to any name such as app-debug-180718.apk with the .apk extension. You may zip the file. You may put the file in the website, such as the CS108-Android-Demo-App-1.19.0_Installer.zip file in https://www.convergence.com.hk/downloads/cs108/ for android phone to download. You may send the file to others for installation.

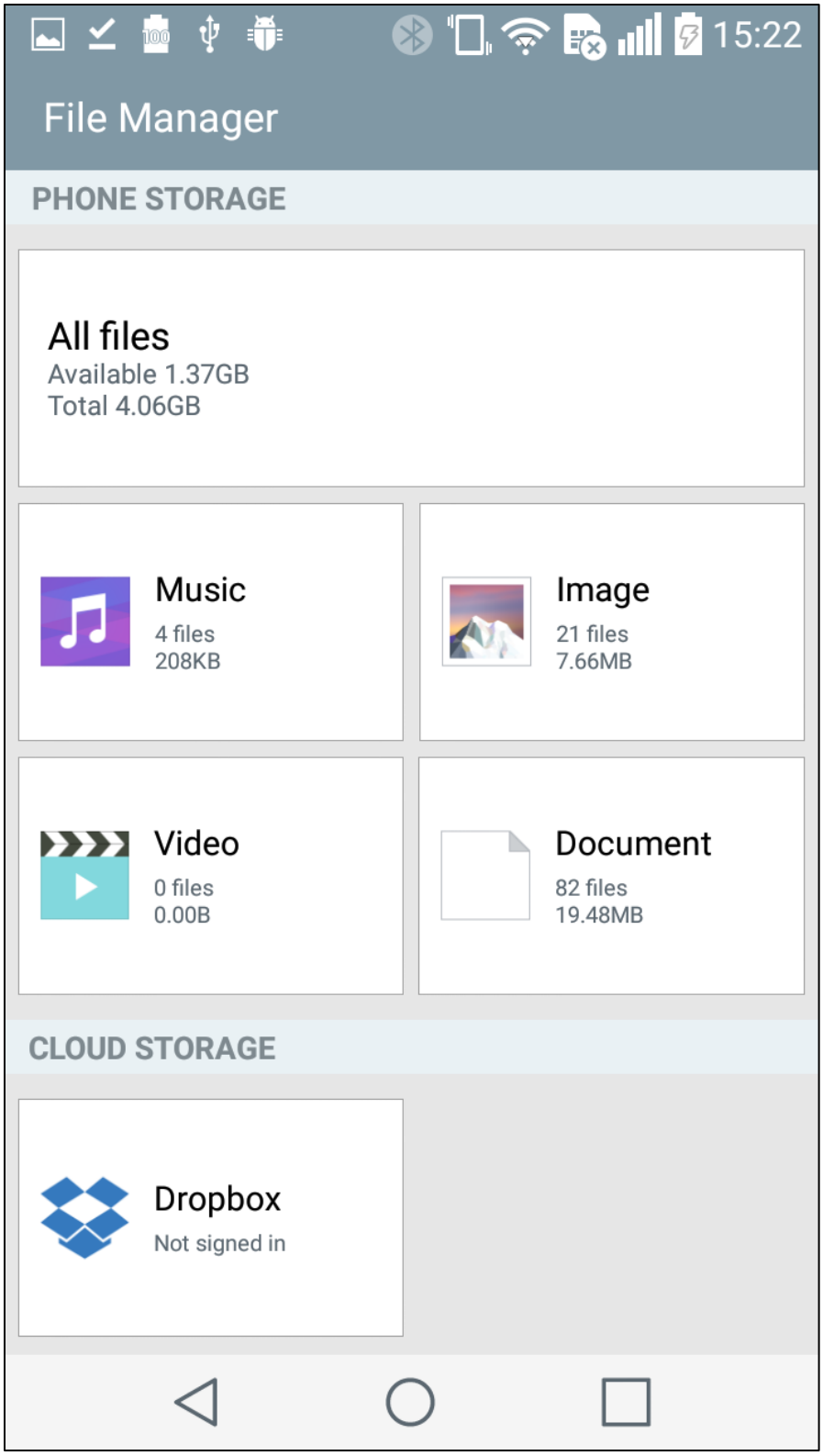
D. File reception: android phone can get the apk file from website using Android phone browser, or from computer using USB connection with computer. The file is usually placed under /Download sub-directory.

E. File location in android phone:

   i. use some 'File Manager' app to locate the received apk file



ii. Select 'Document'



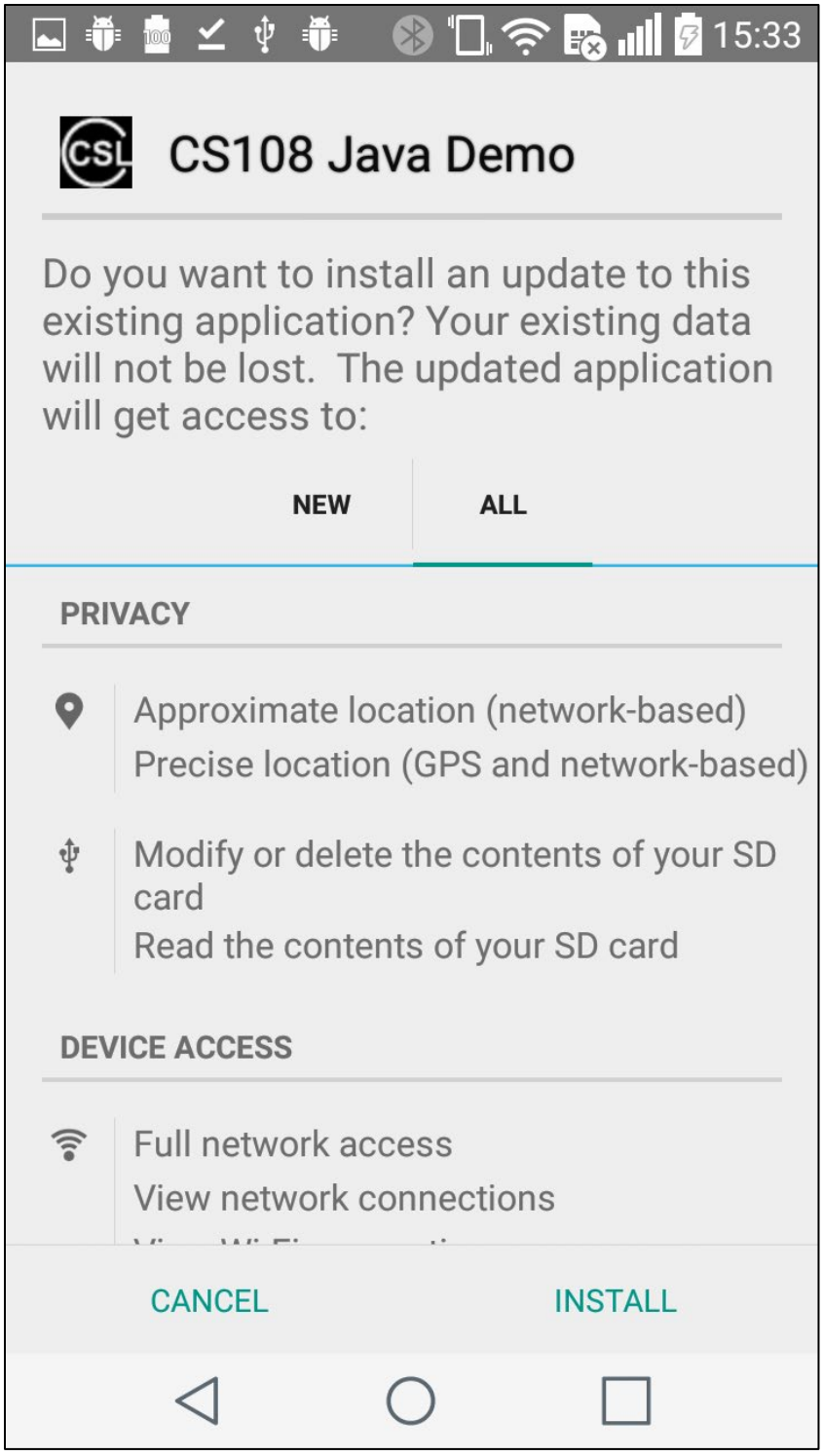
iii. Browse through different sub-directories until the appropriate apk file is found in the list. Noted that the usual directory is in /storage/emulated/0/Download

iv. end

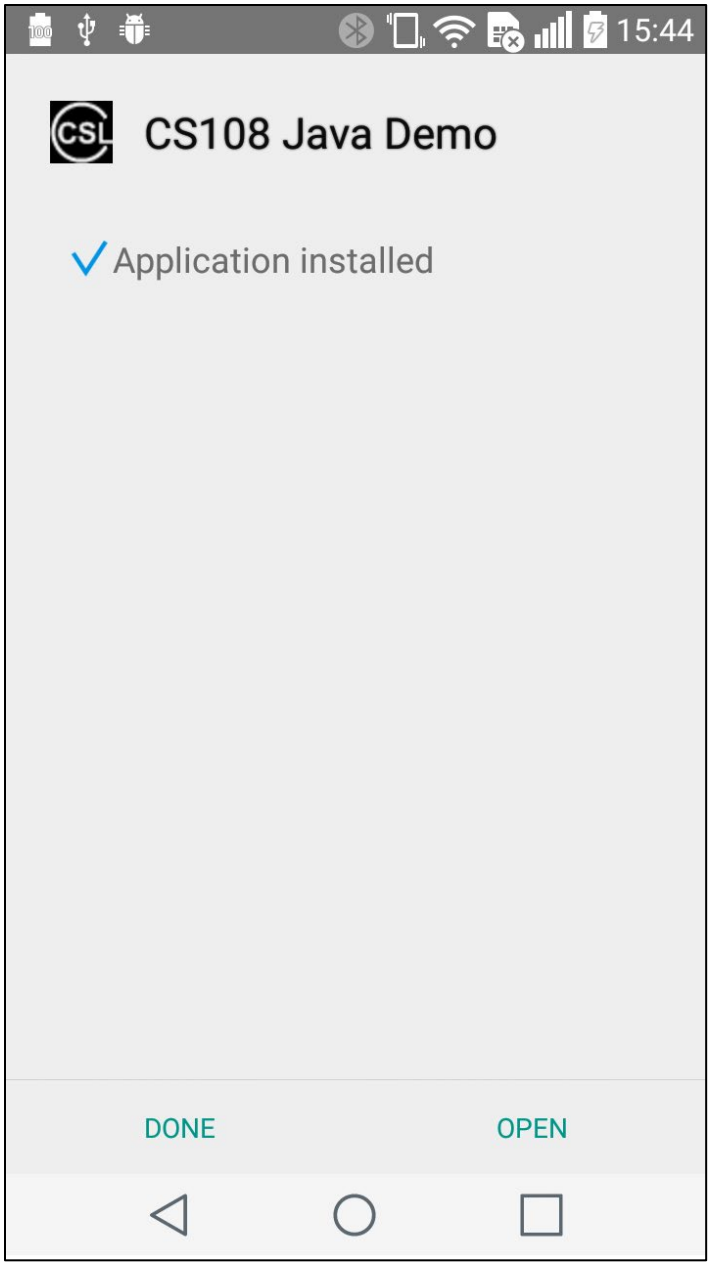
F. apk file installation in android phone

i. Select the appropriate apk file found in 'FileManager' app

ii. Select 'ALL' Tab and then 'Install'



iii. Select Open



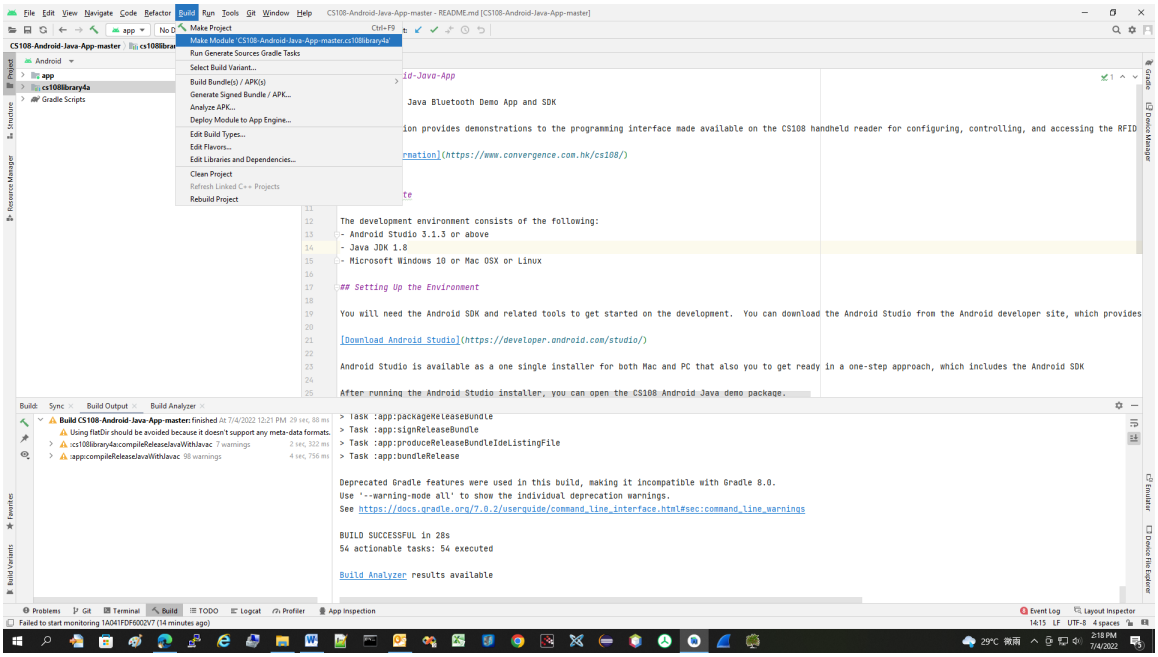
iv. Final display

G. End

3.5 Import CS108 Library to Your Own Project

1) create library module

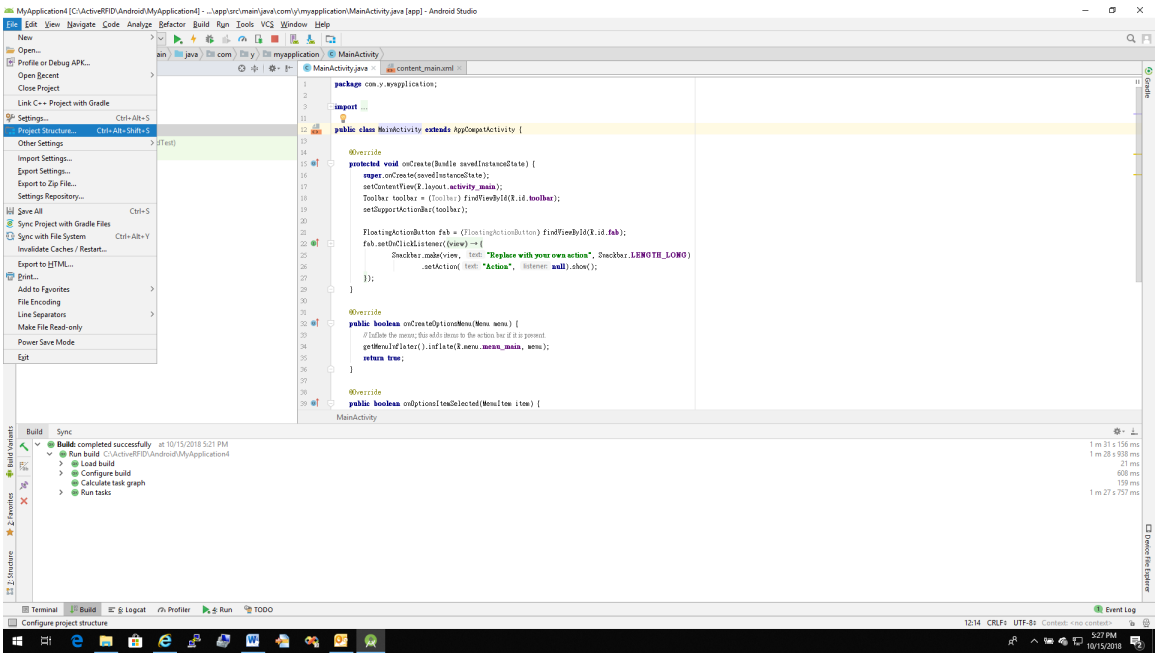
a. Select the “cs108library4a” module in “Project”->”Andriod” in the left hand side. Select “build”-> “make module ‘…cs108library4a’.



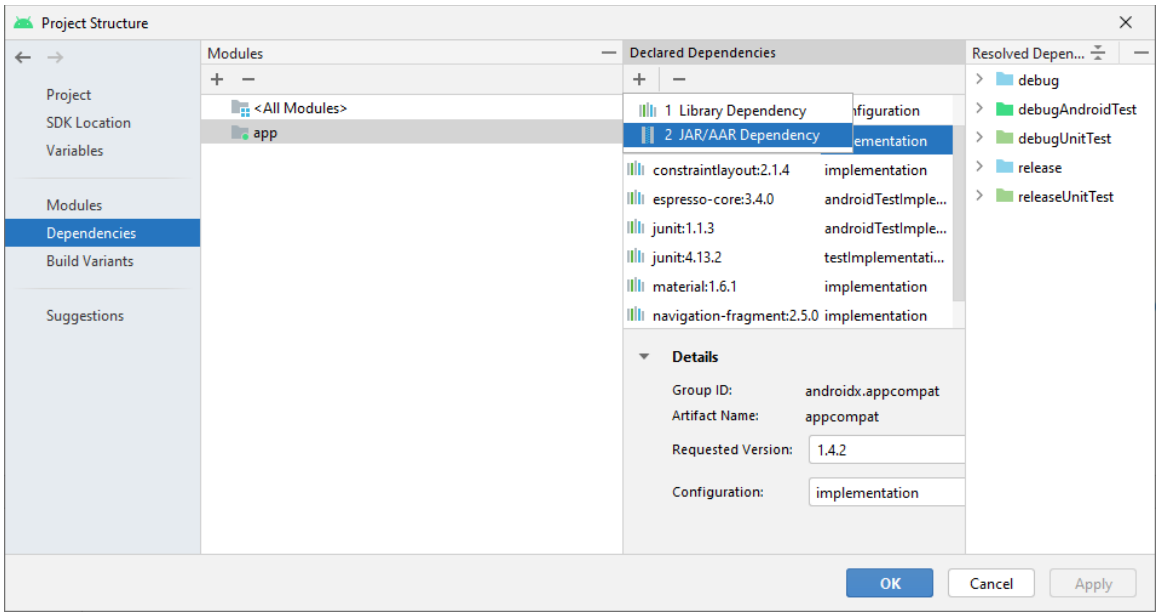
There will have a cs108library4a/build/outputs/aar/cs108library4a-debug.aar

b. Copy the cs108library4a-debug.aar from the CS108ADemoApp\app\libs to your own project, for example, call it MyApplication as in the screen captures below, put it under MyApplication\app\libs

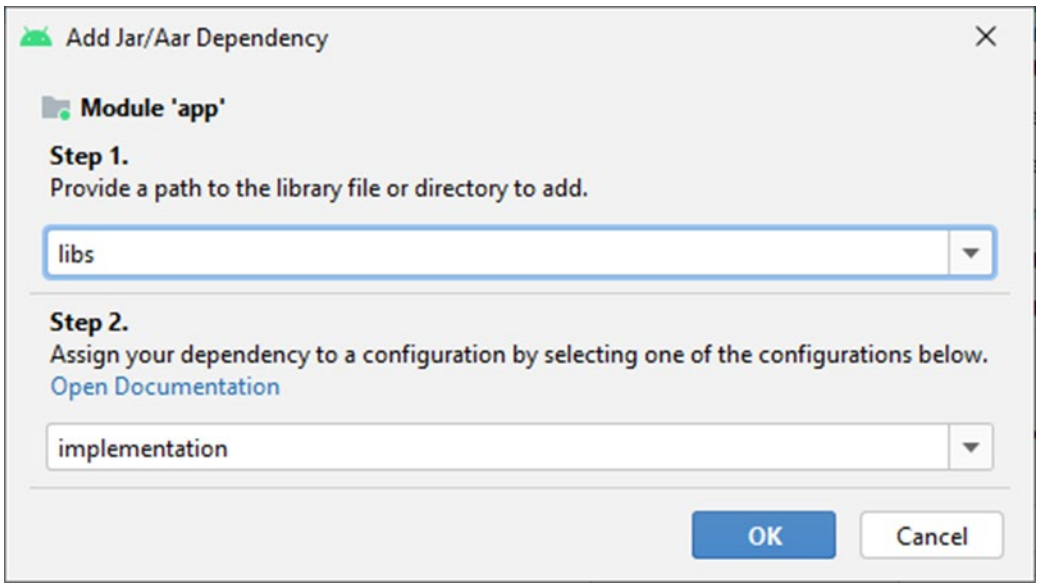
c. Select File -> Project Structure



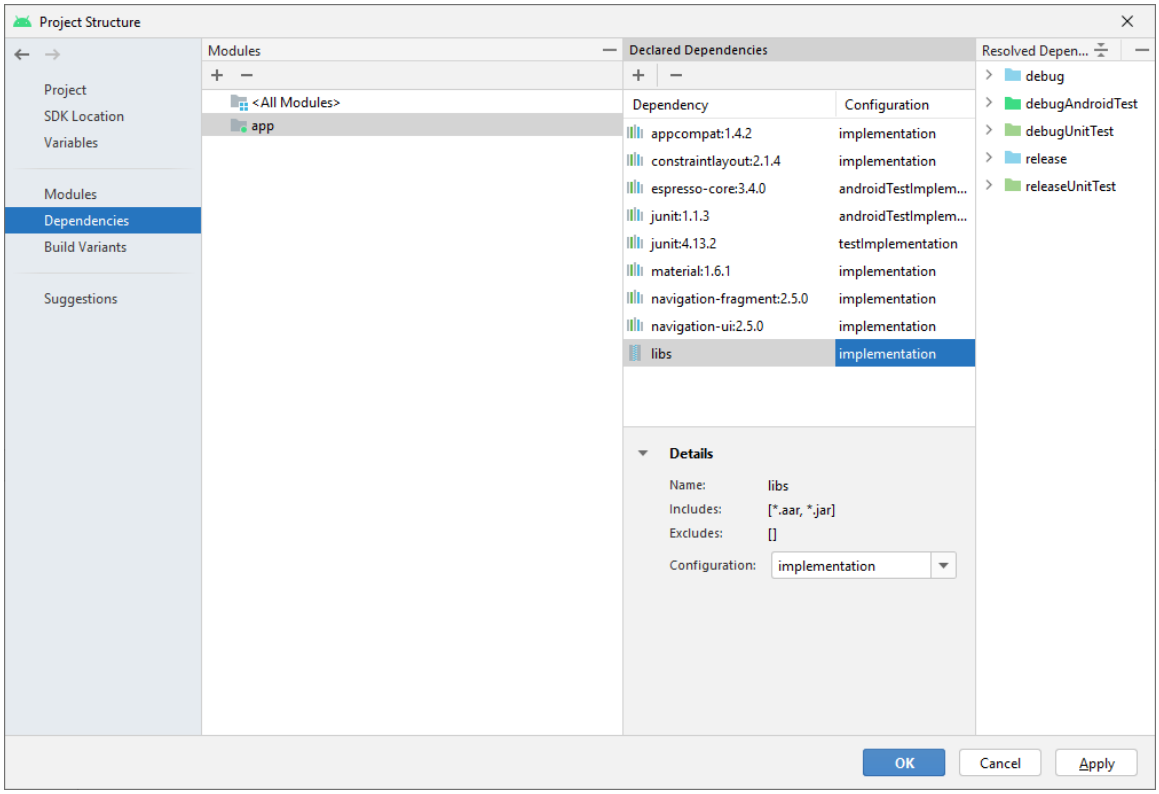
d. Within ‘project structure’, Select ‘Dependencies’, + in Declared Dependencies, ‘JAR/AAR dependency’



e. Fill in the path where we put the aar file. Select “OK”

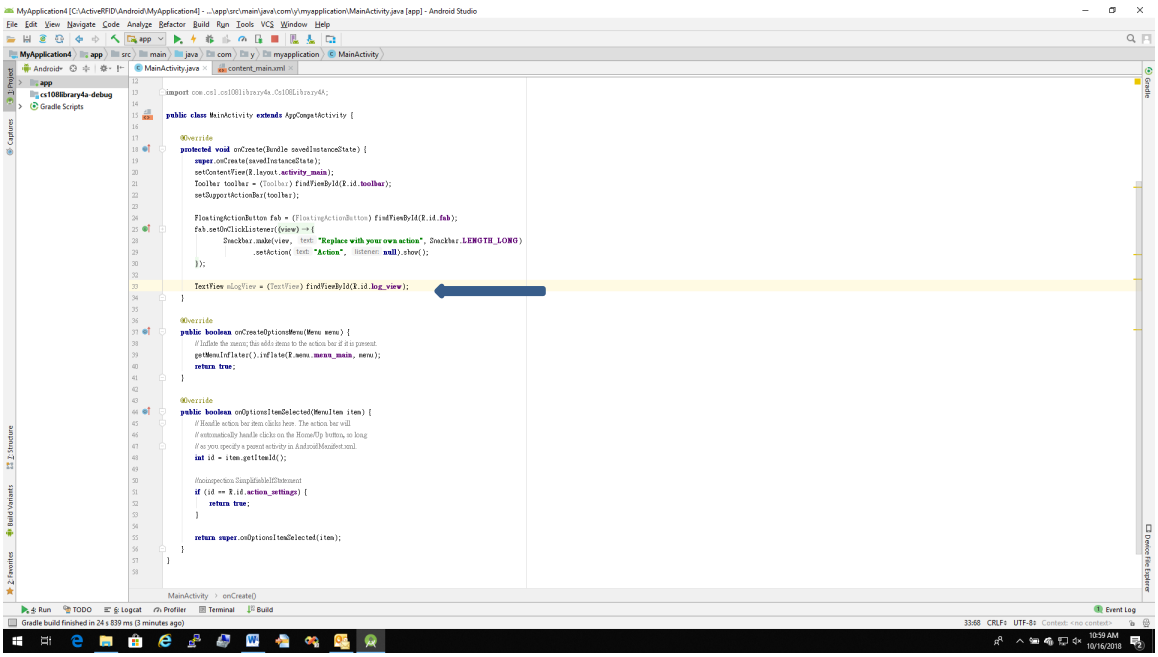


f. There is new dependency for app

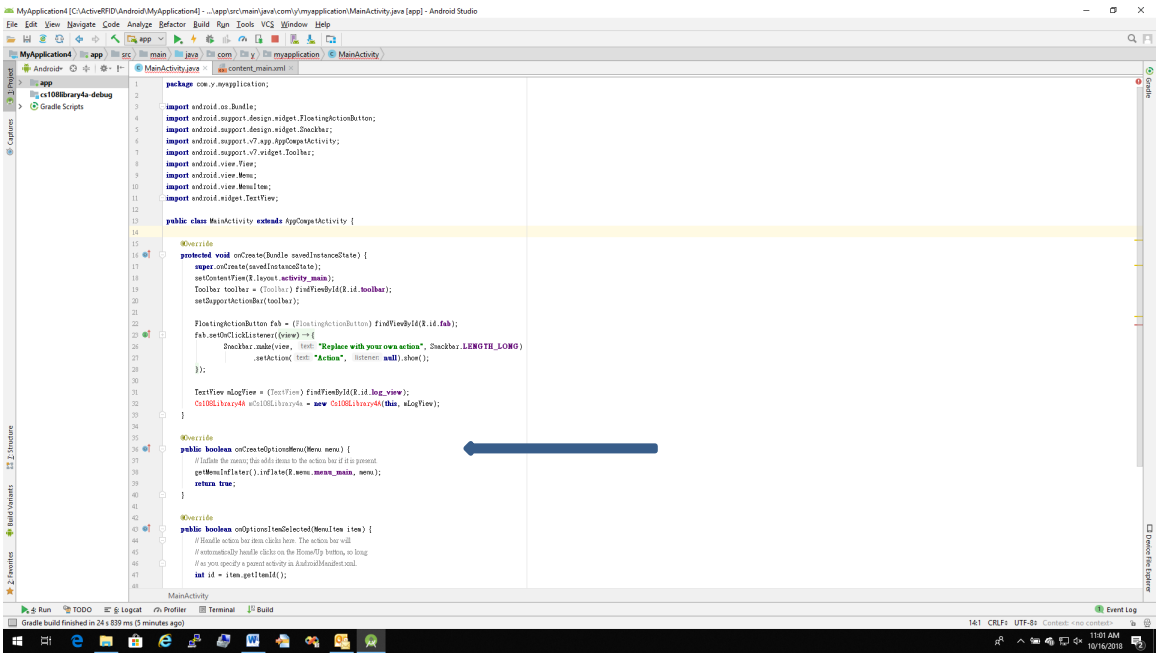


2) Use library module in your project apps

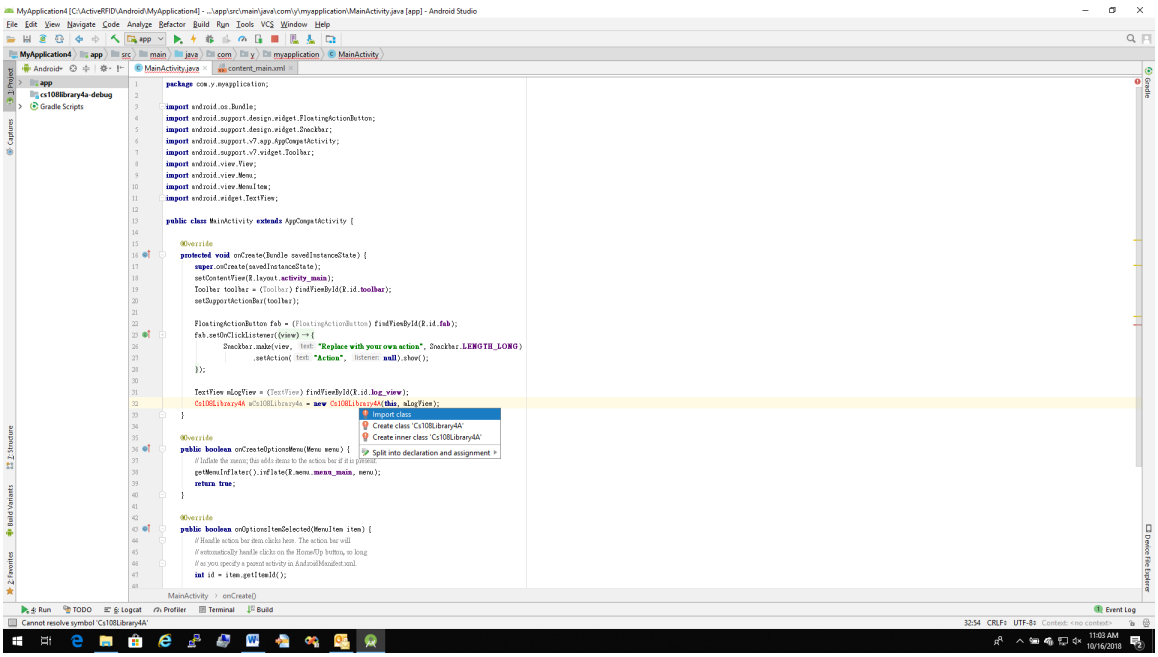
1. Define a TextView class mLogView for library debug



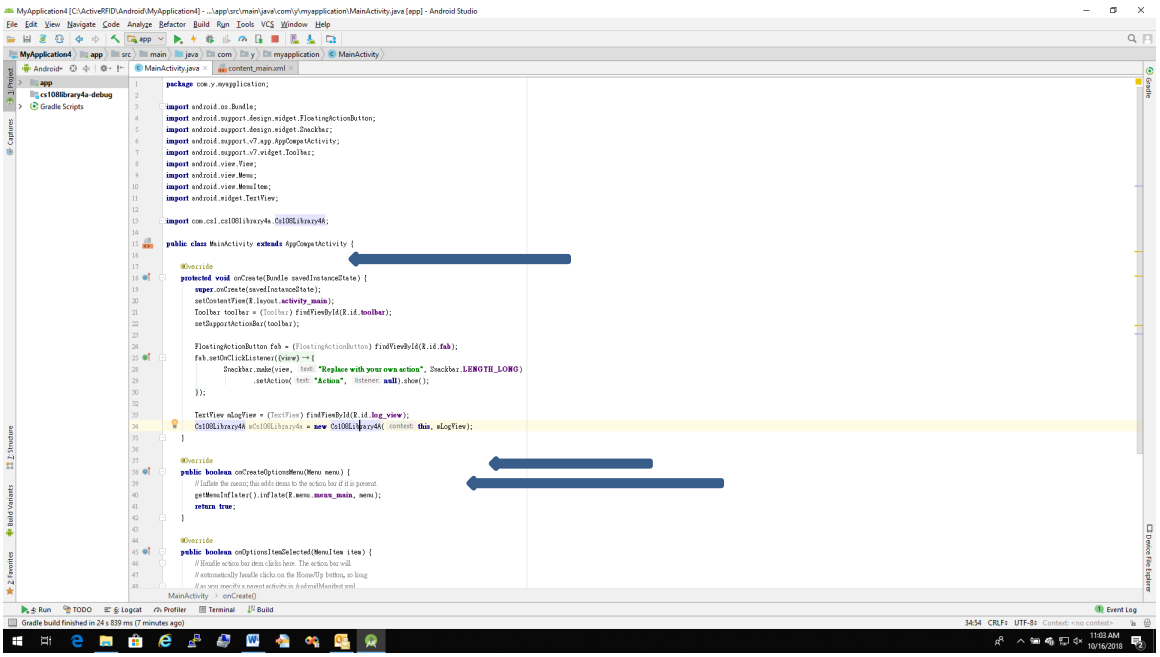
2. Define the library class in your project apps (Cs108Library4A mCs108library4A = new Cs108Library4A(this, mLogView))



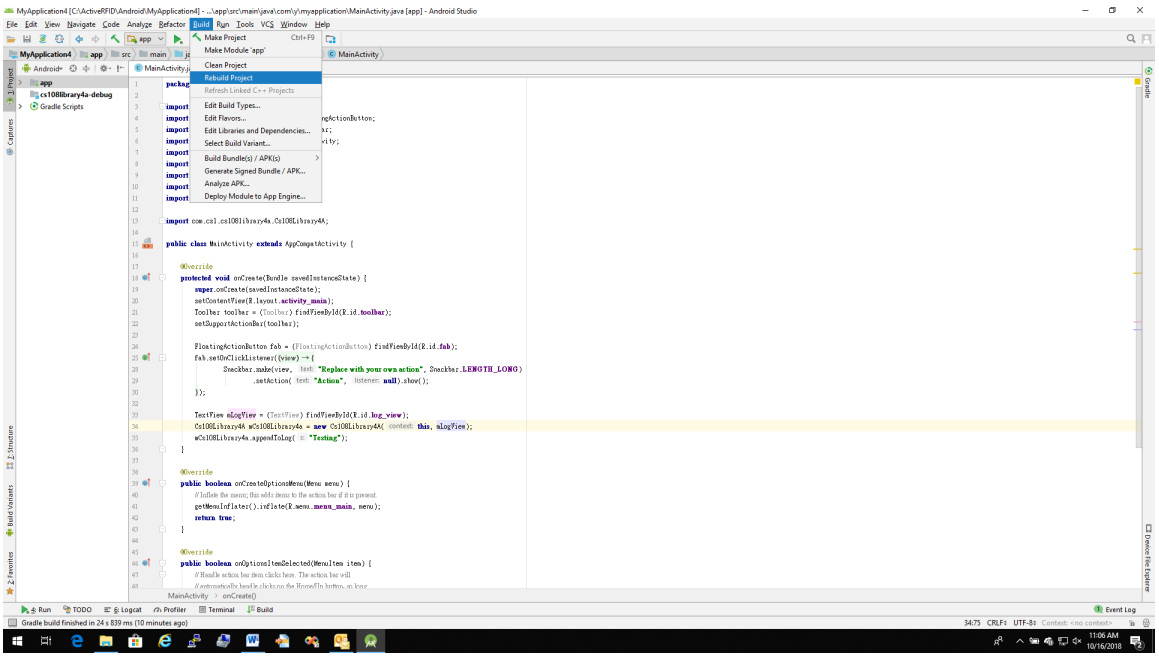
3. There is Red word Cs108Library4A. Put cursor on the word. Press ALT + Enter.



4. Select ‘Import Class’. You will see Red word changed to black word. You will see new line ‘import com.csl.cs108library4a.Cs108Library4A’



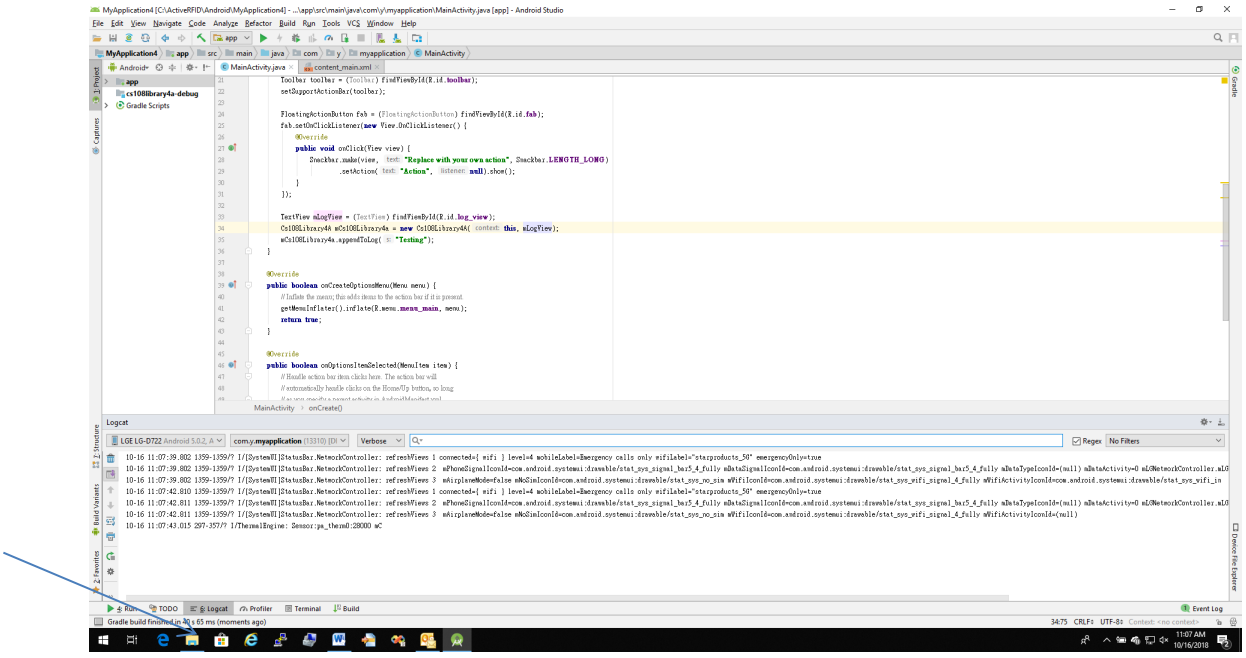
5. Rebuild. If no error, it is OK.



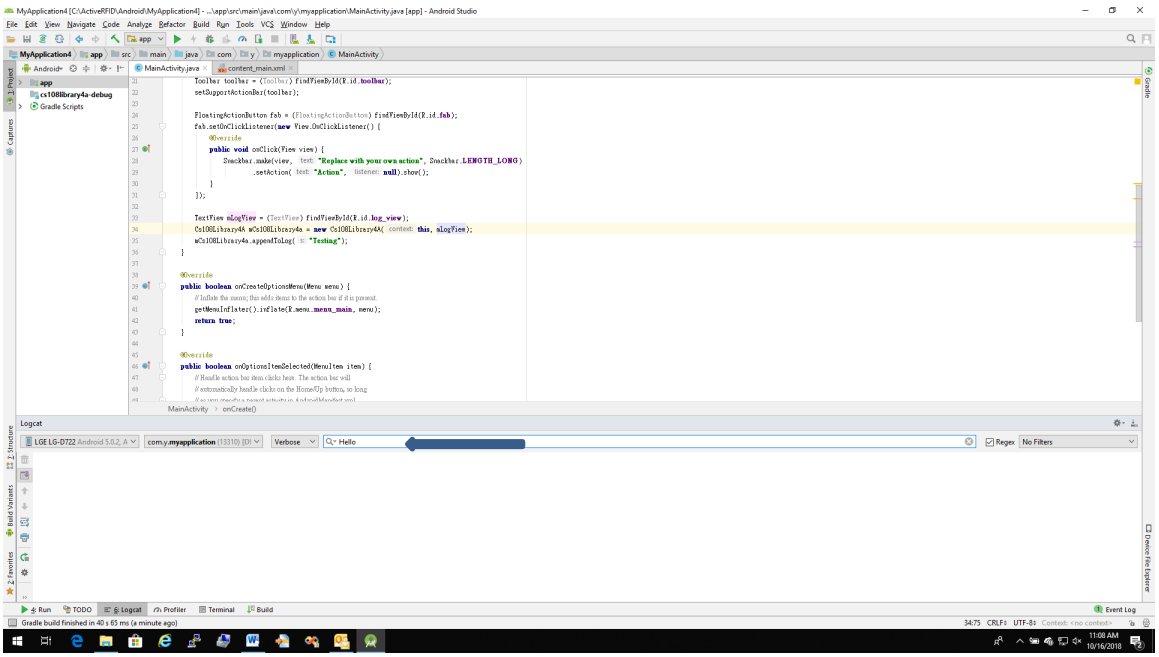
3) Test library module in your project apps

1. Connect your device

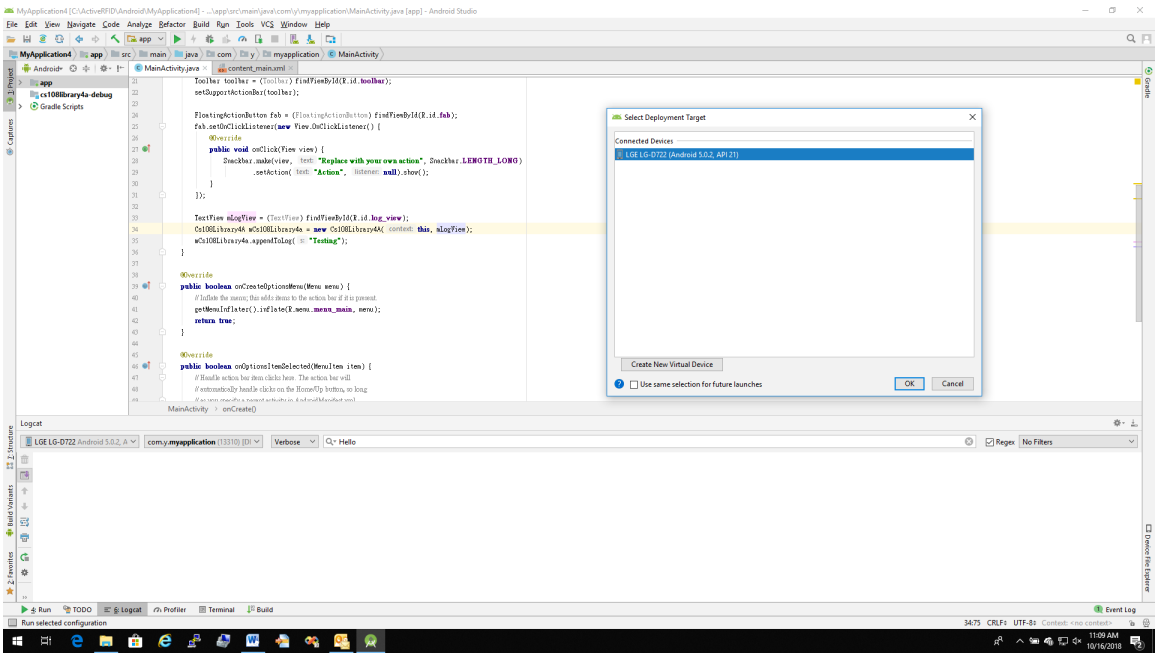
2. Select ‘Logcat’



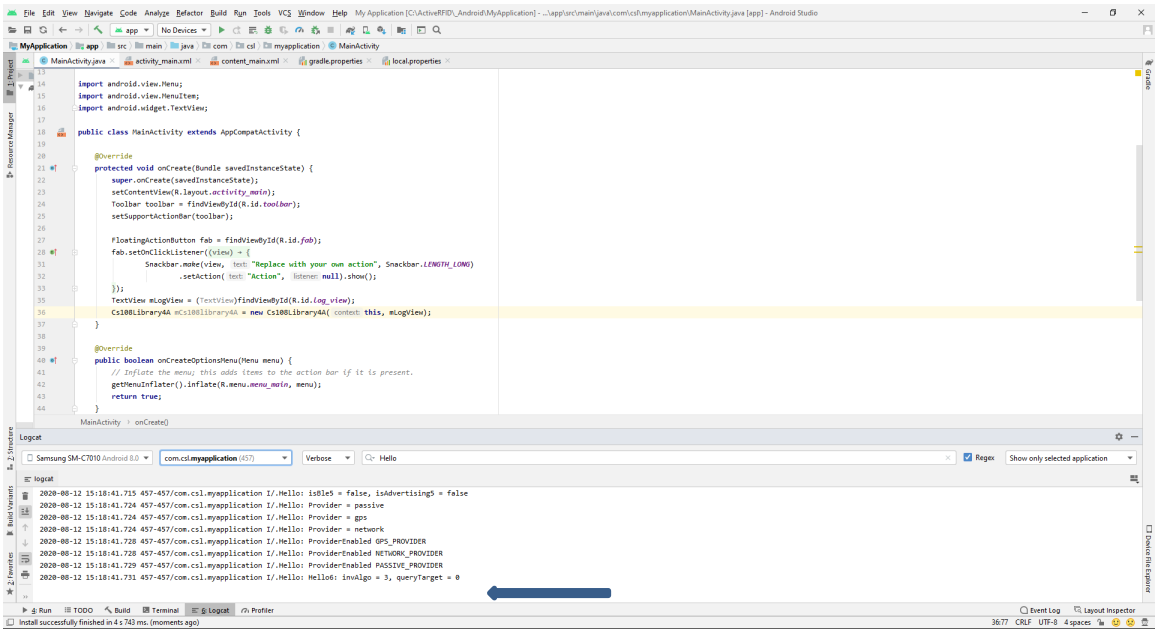
3. Set ‘Hello’ in the filter area



4. Download yourProject apps to an android device



5. You should see the debug message which implies ok to use the library.



3.6 How to Generate APK for Google Play

To generate apk for google play download and installation

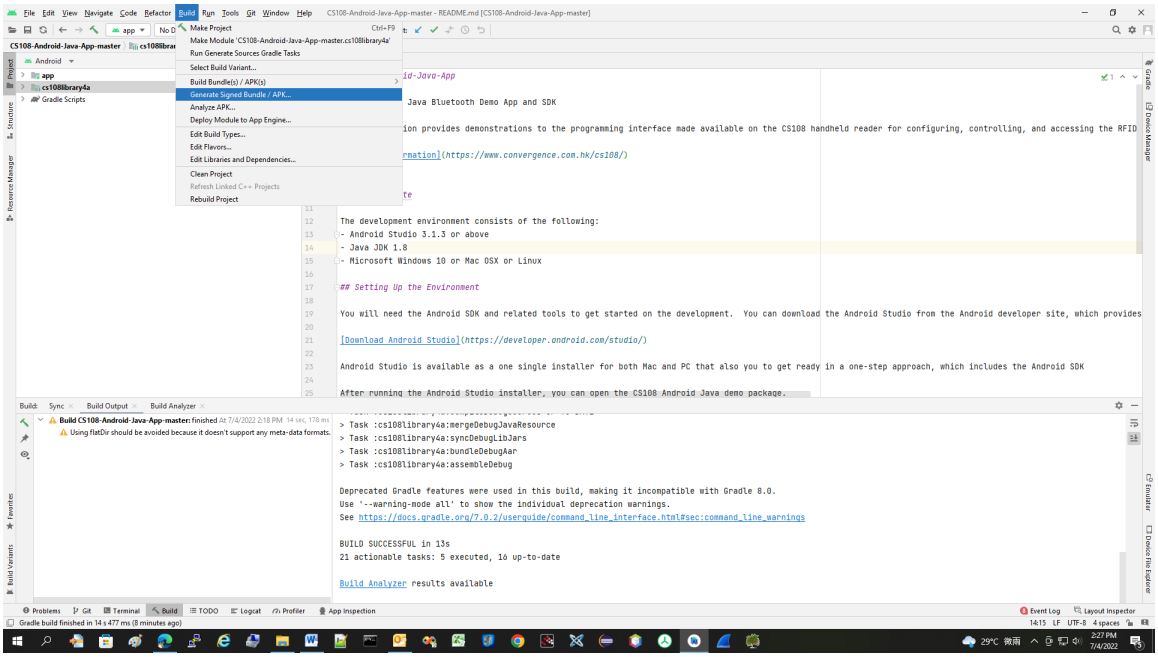
1. Assumption: Google play console account has been setup. This requires account creation, payment and others. For details, please check for example https://support.shopgate.com/hc/en-us/articles/115004959928-Setting-up-a-Google-Play-Developer-Account

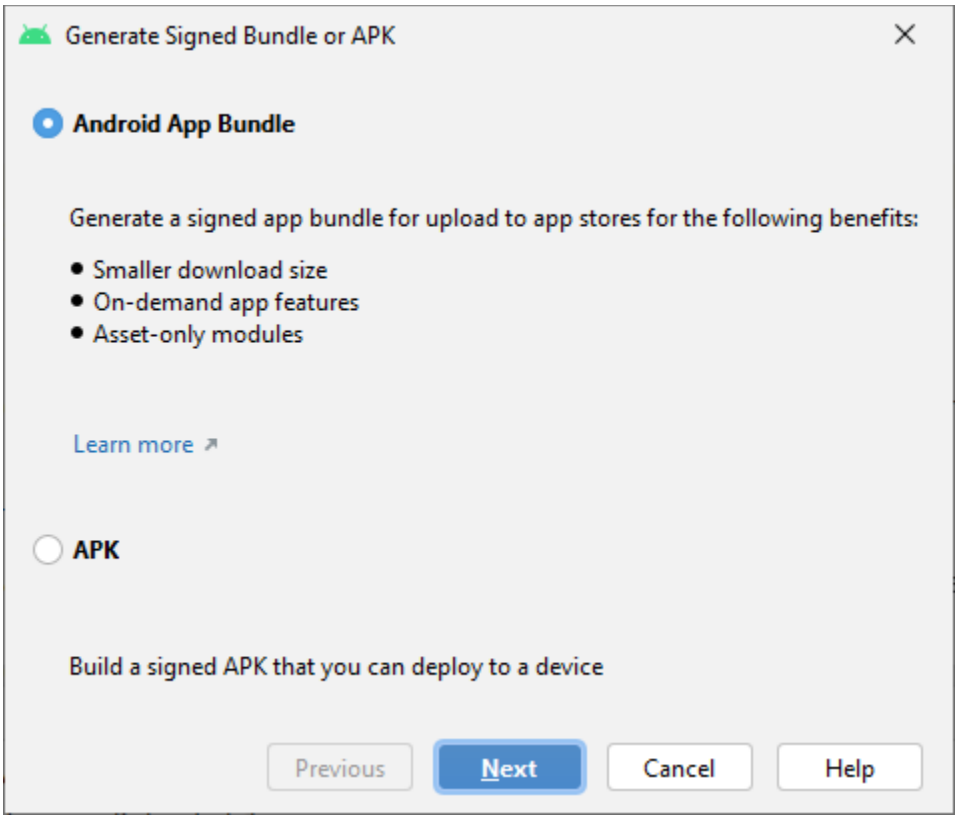
2. Source file preparation

    i. If possible, remove debug message in the release source code.

    ii. Change the versionName value within build.gradle for the Module app. Change the versionCode value within build.gradle for the Module app VersionCode value is used by google play console to compare that of old app and to identify if new app is uploaded. VersionCode must be different and have value greater than the previous versionCode value.

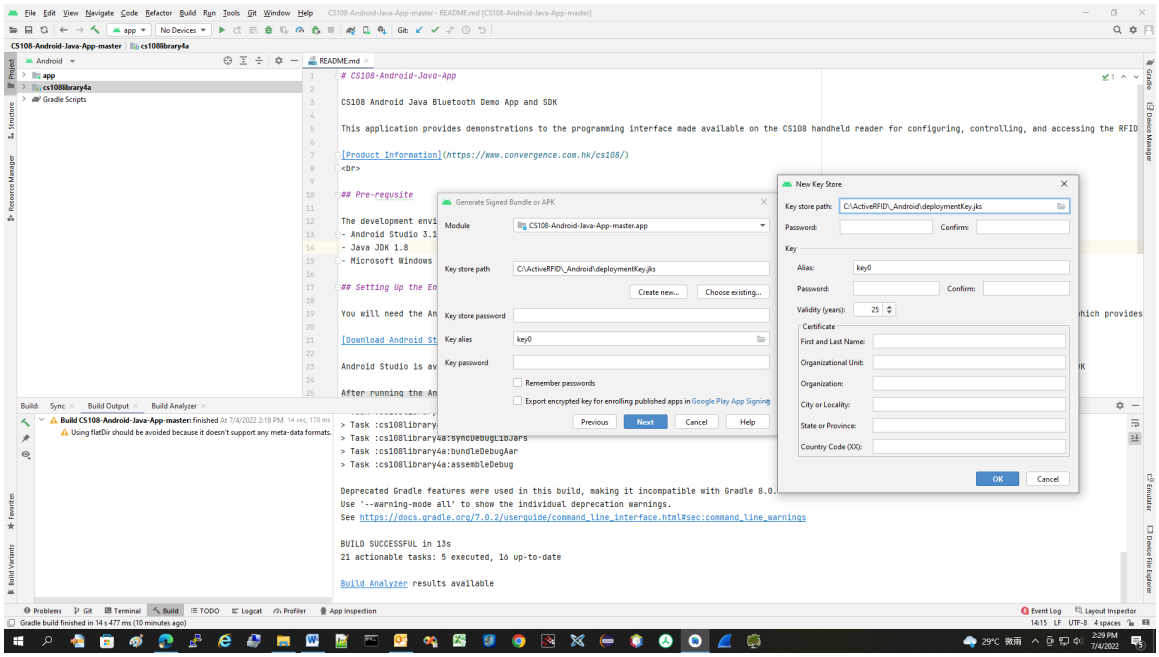
3. Select ‘Generate Signed Bundle/APK’ in ‘Build’ menu of Android Studio



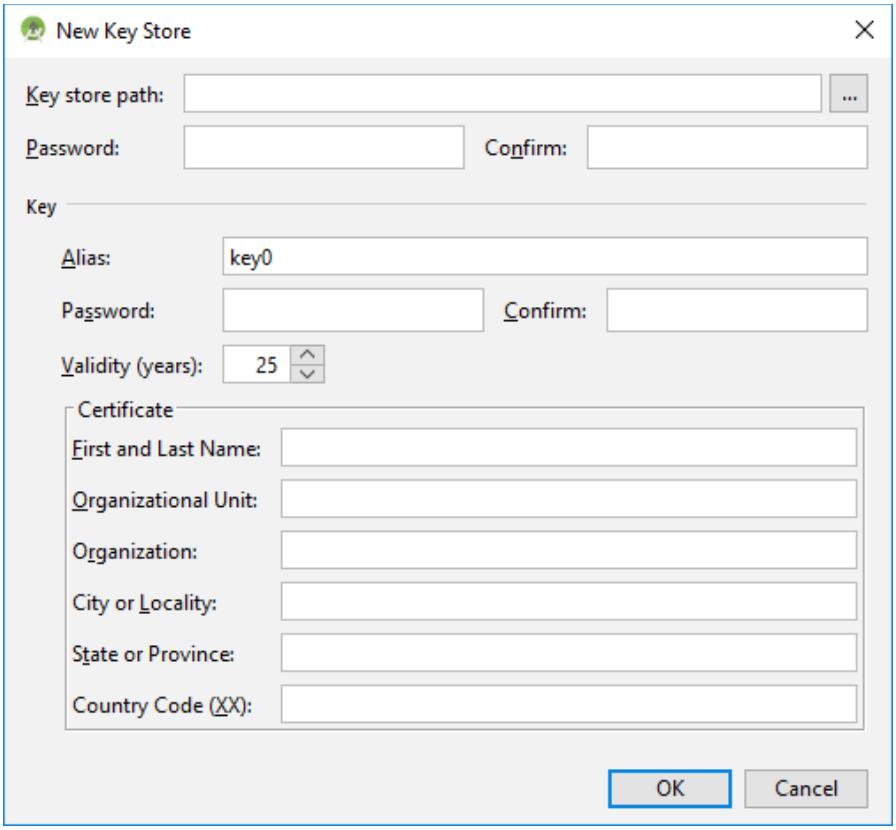


Select ether “bundle” or “apk”. “Bundle” will generate .aab file. “apk” will generate .apk file. Select “next”

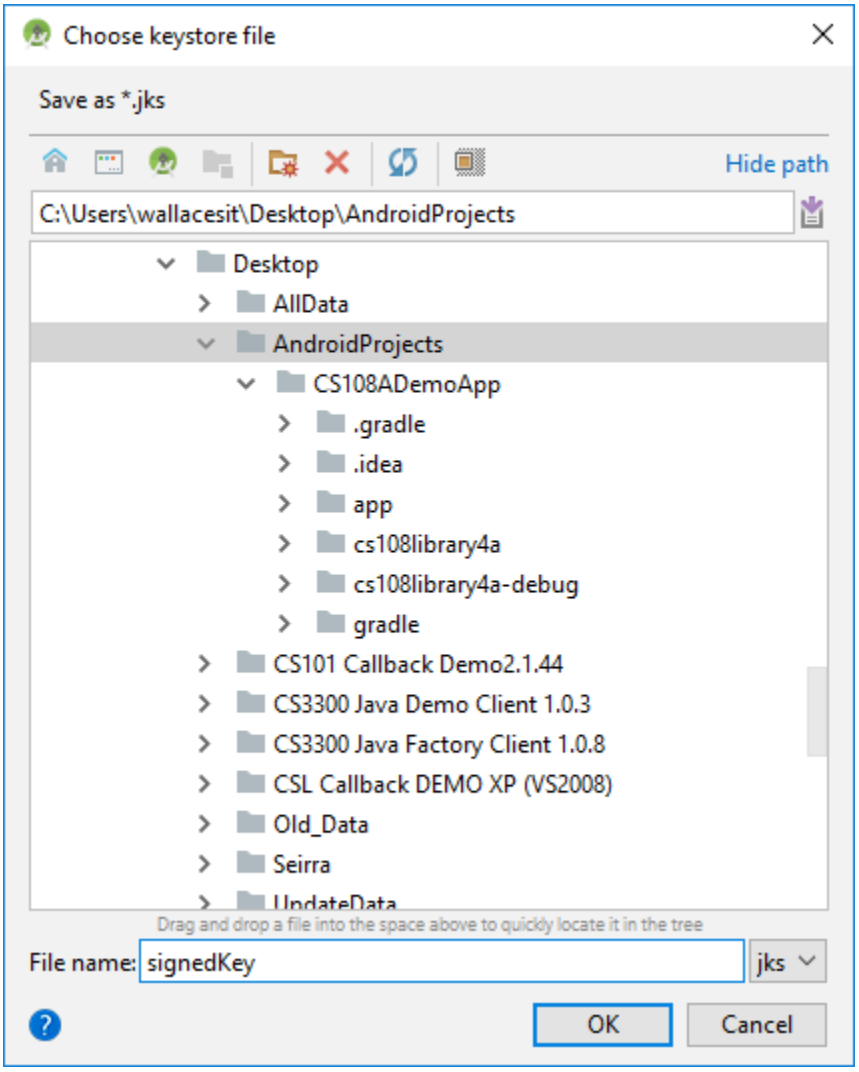
4. For the first signed APK generation, select “Create new…” to generate the upload key



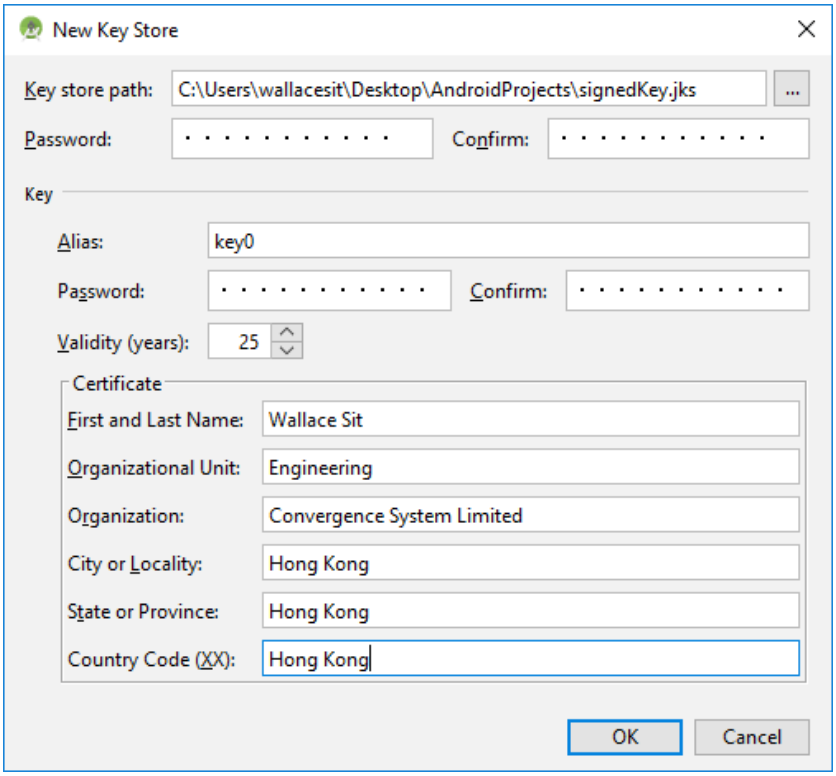
5. Select “….” In the row “Key store path”



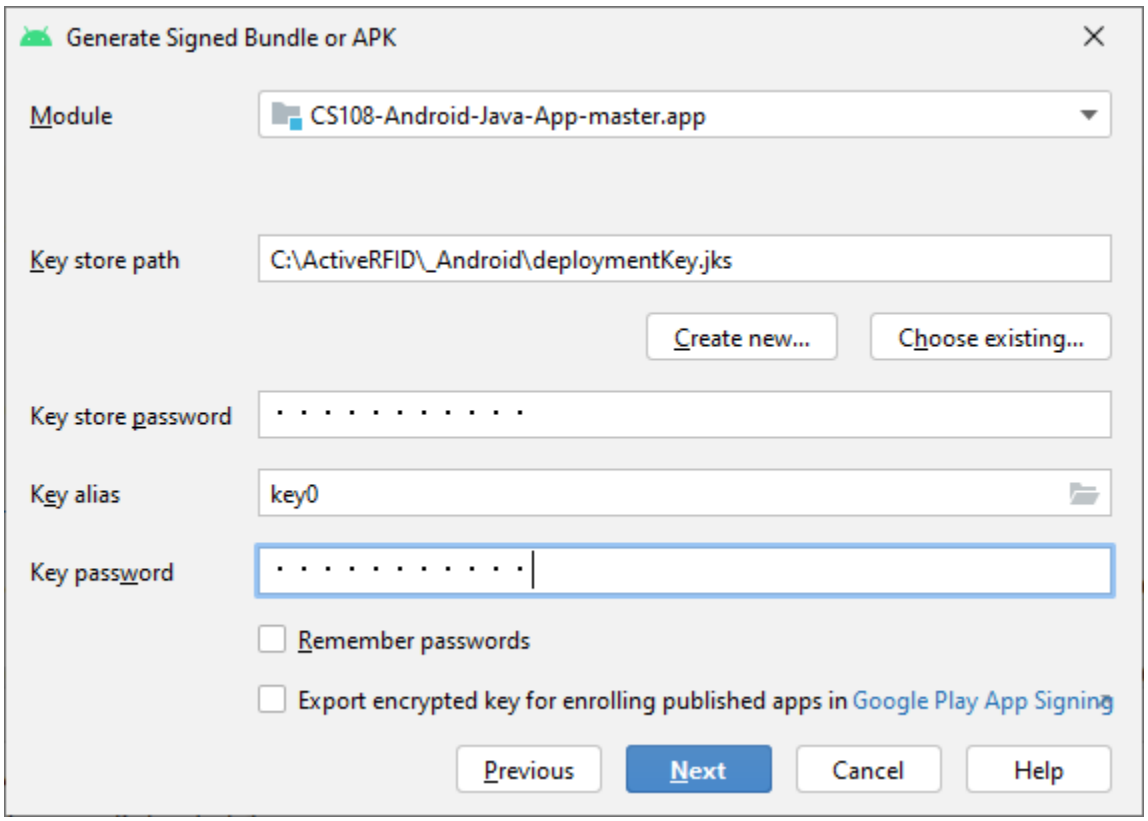
6. Select the location in the directory tree. Give name, such as signedKey in ‘File name’ row. Select ‘OK’



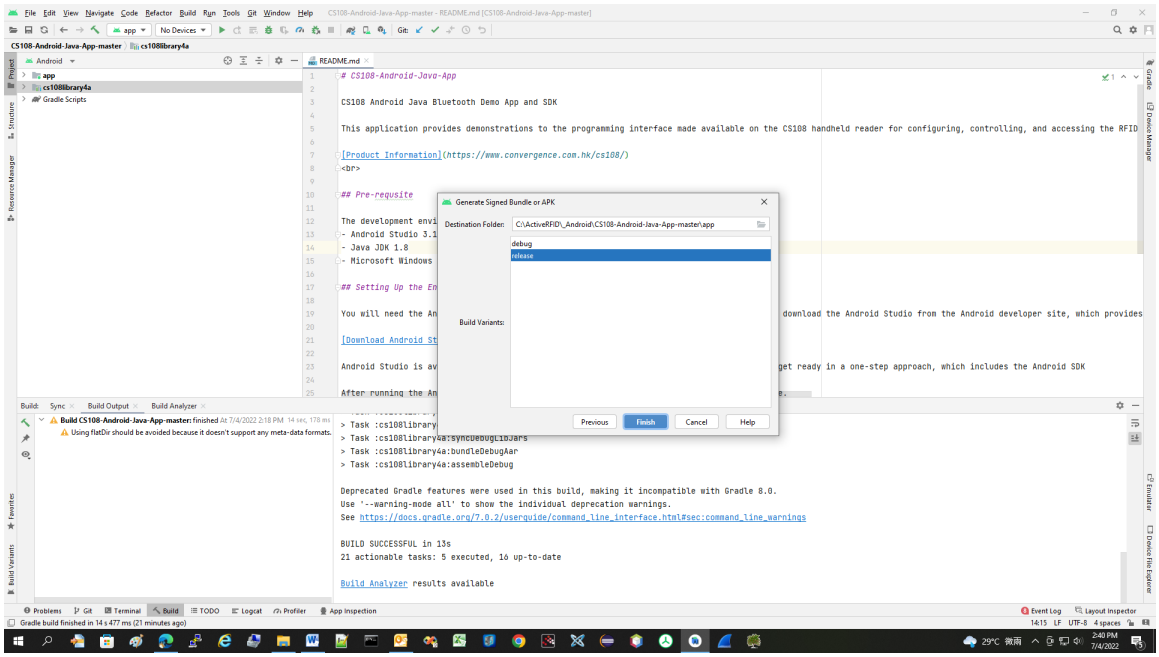
7. Enter all fields and Select ‘OK’



8. Select ‘Next’

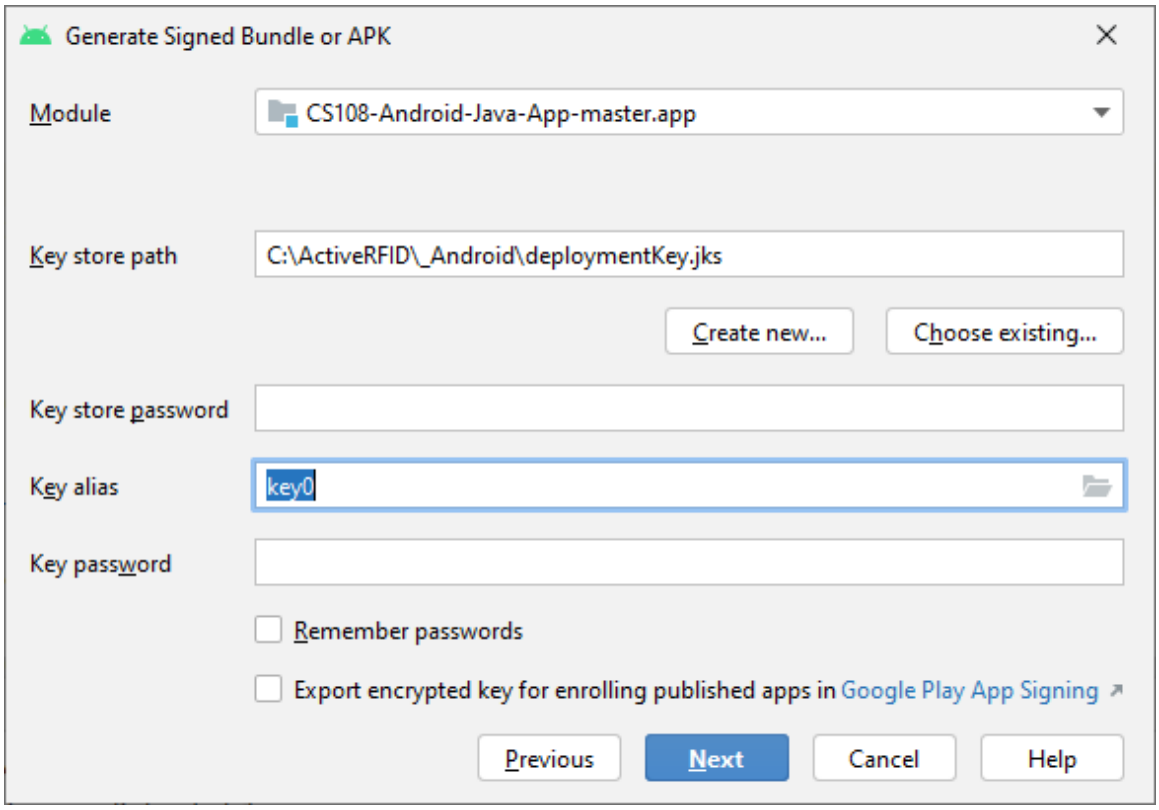


9. Select “release” build variants. Then Select ‘Finish’

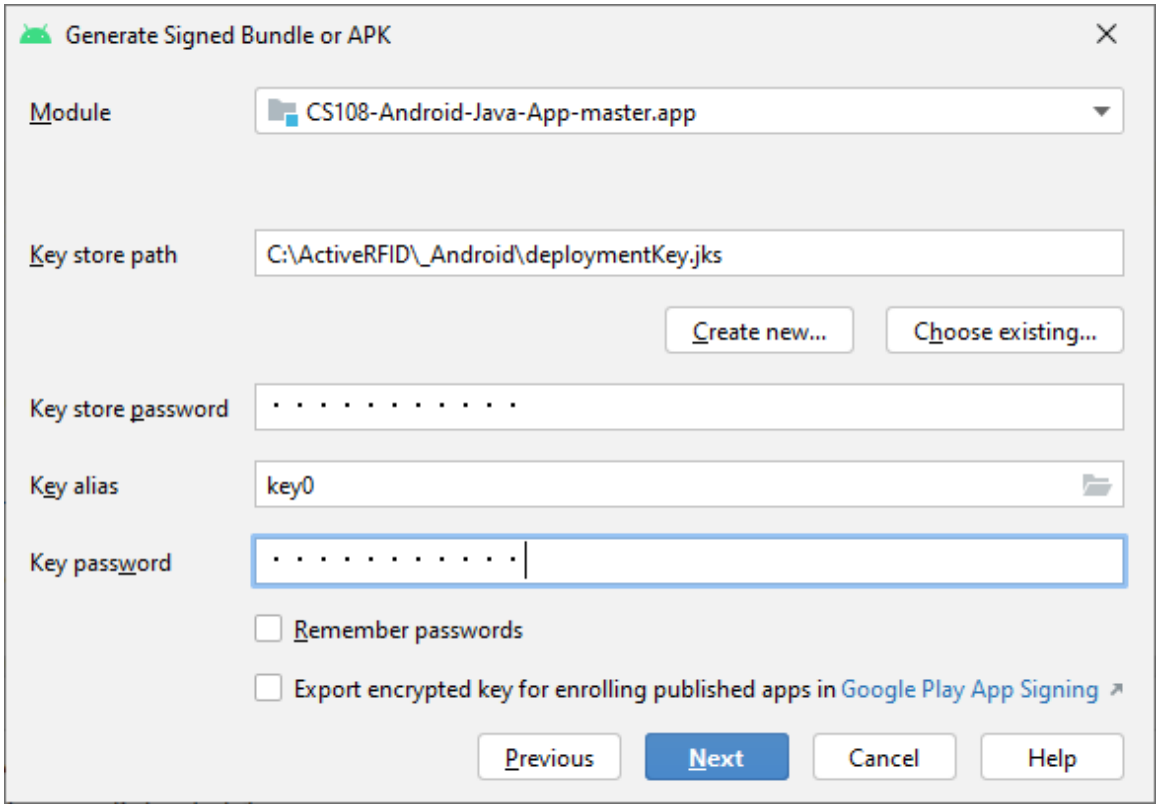


10. Wait for the end of ‘Gradle Build Running’ to create the signed APK

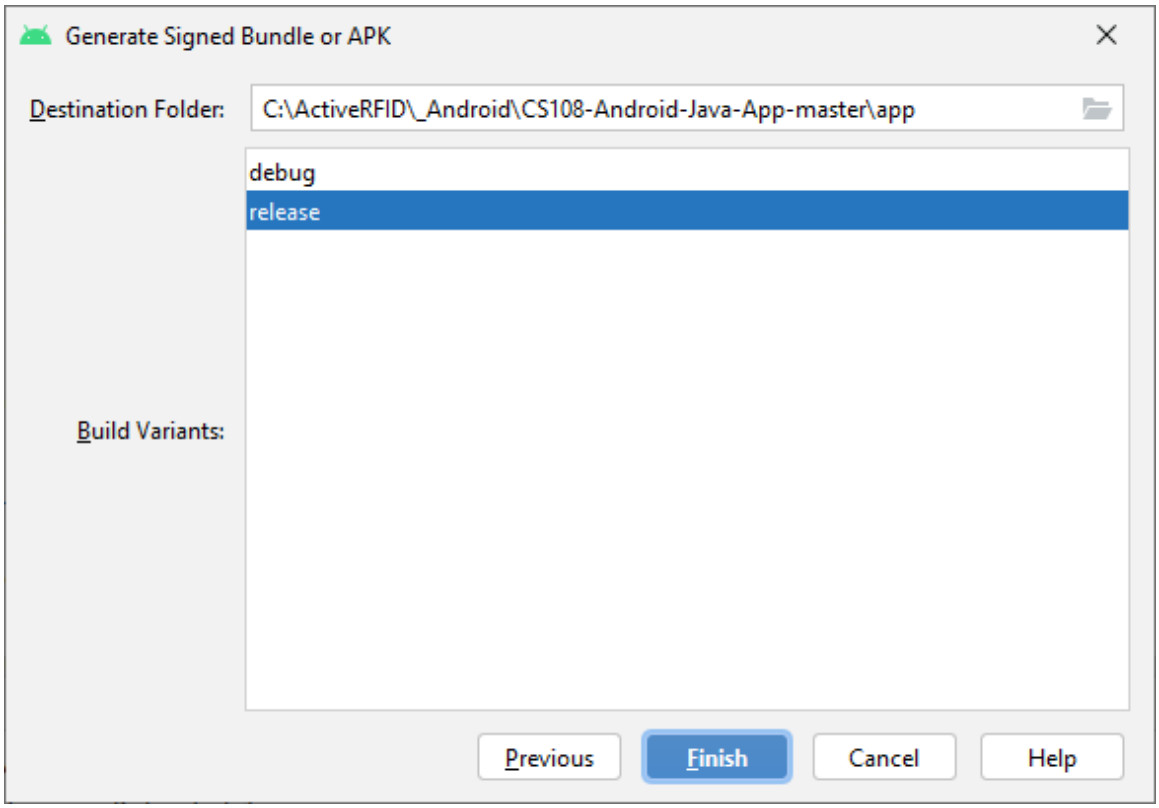
11. For the normal signed APK generation,



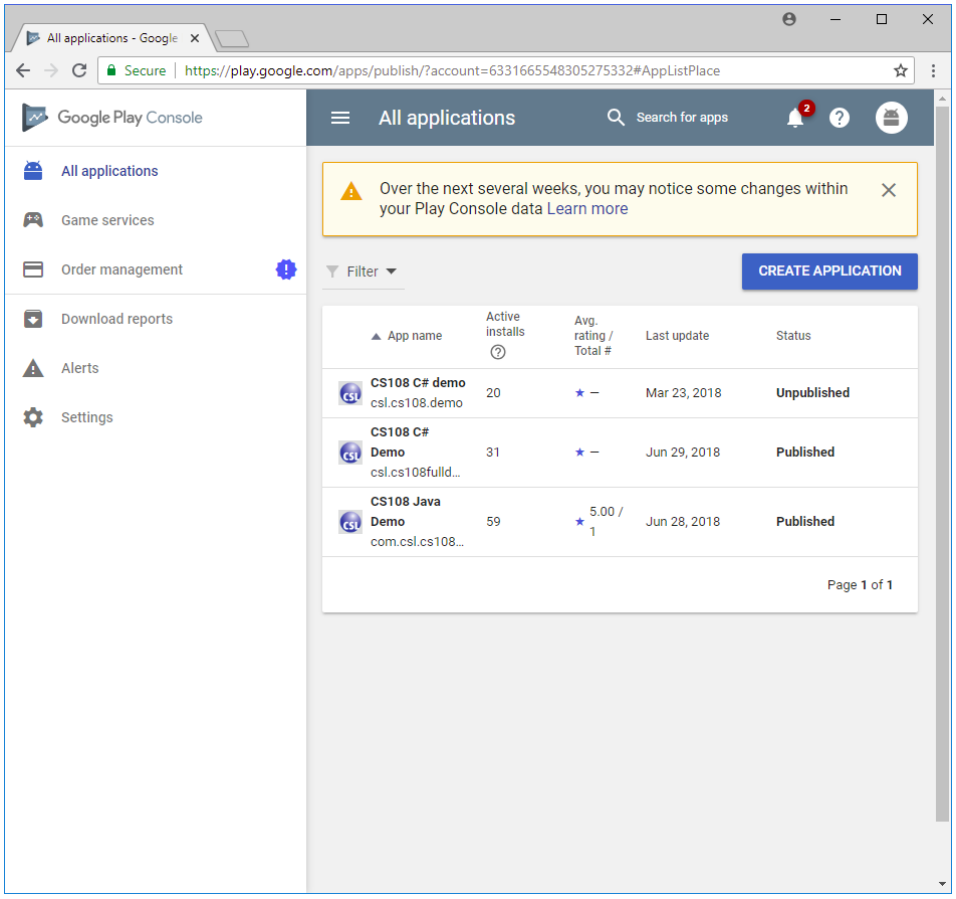
12. Fill in the password fields and Select ‘Next’



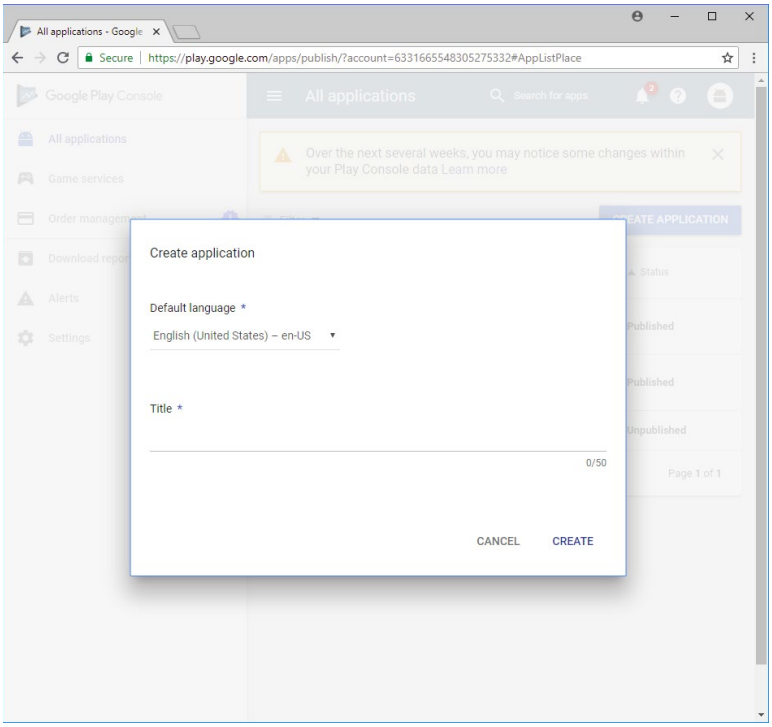
13. Select “release” build variant. Select ‘Finish’



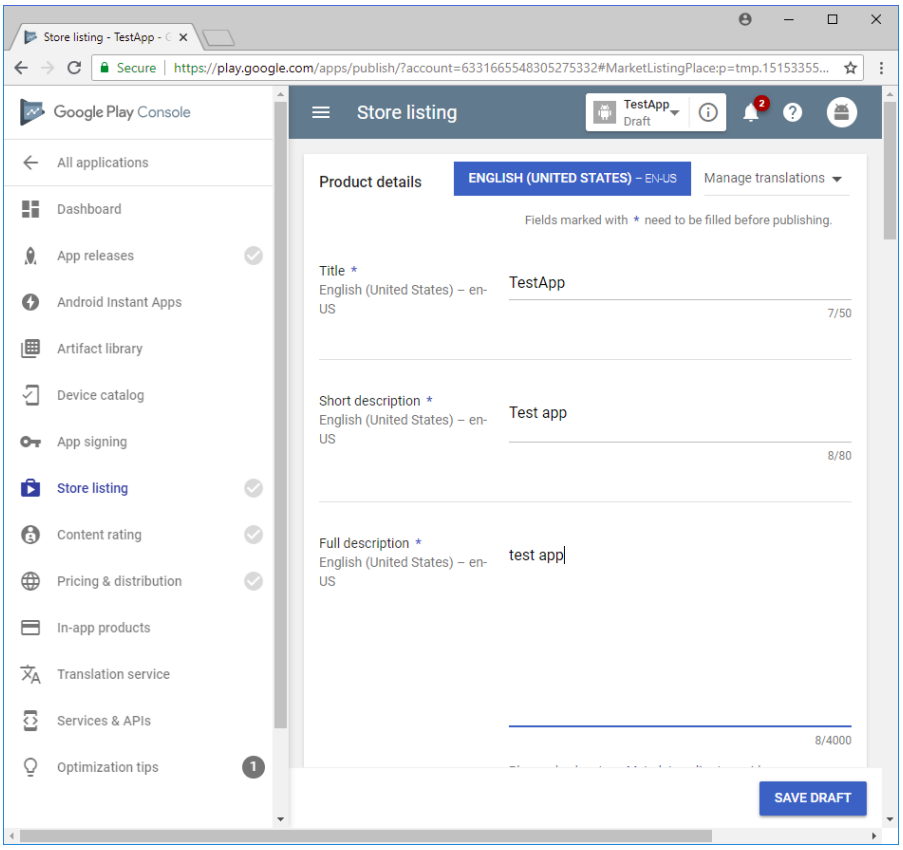
14. Wait the ending of 'Gradle Build Running' to create the signed APK
15. Signed APK file location: if successful, the file app-release.apk is in CS108AdemoApp\app\release.
16. File inventory: rename the app-release.apk to any name such as app-release-180718.apk with .apk extension.
17. File publish: within google play console. For the first time publish, select "Create application"



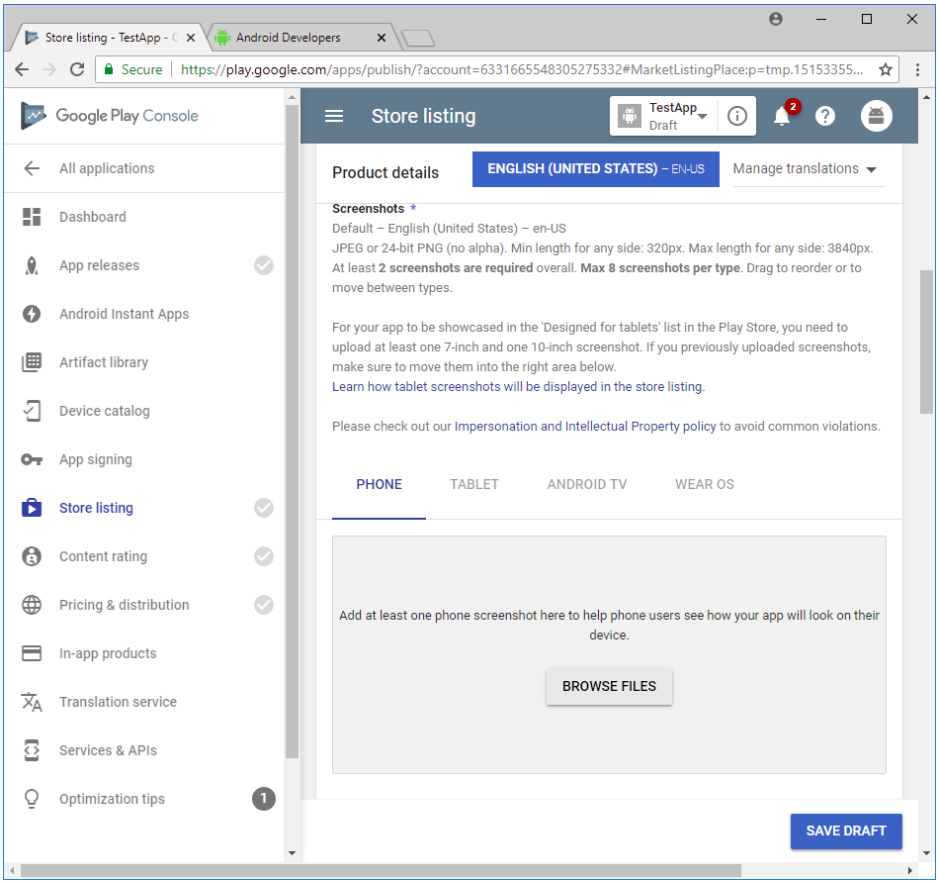
18. Set language and Title. Then Select ‘Create’



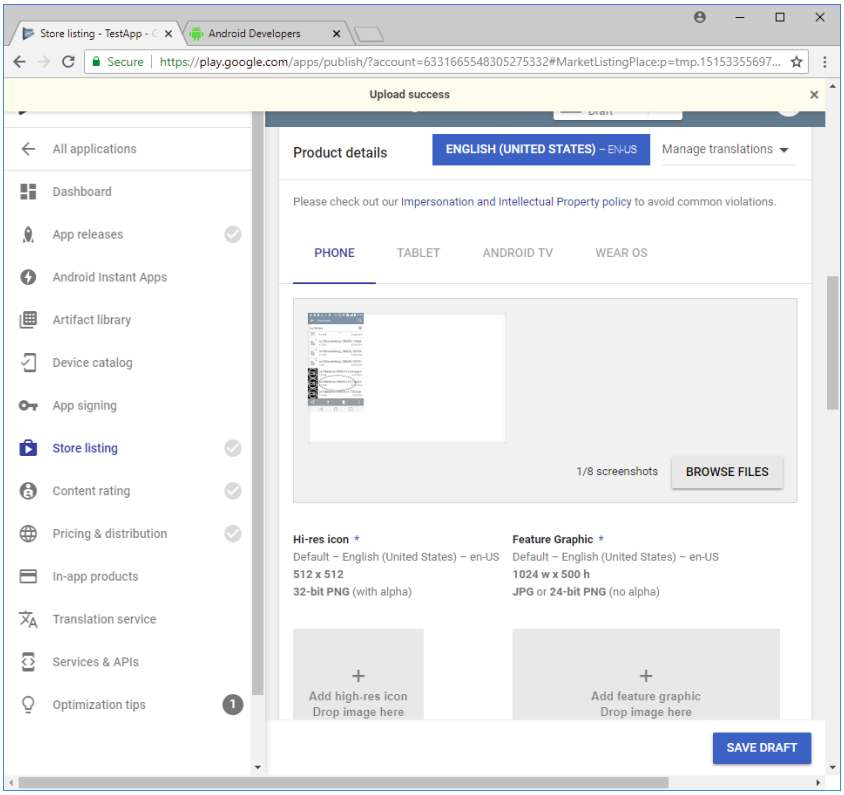
19. Fill in ‘Title’, ‘Short description’ and ‘Full description’.



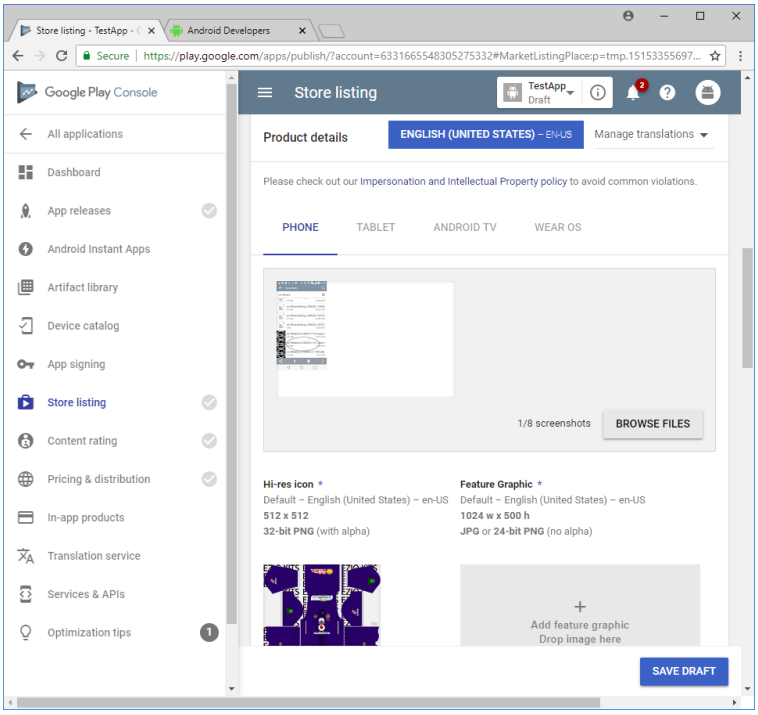
20. Go downwards to find the Screenshots and Select ‘Browse Files’ to select some screen shot pictures.

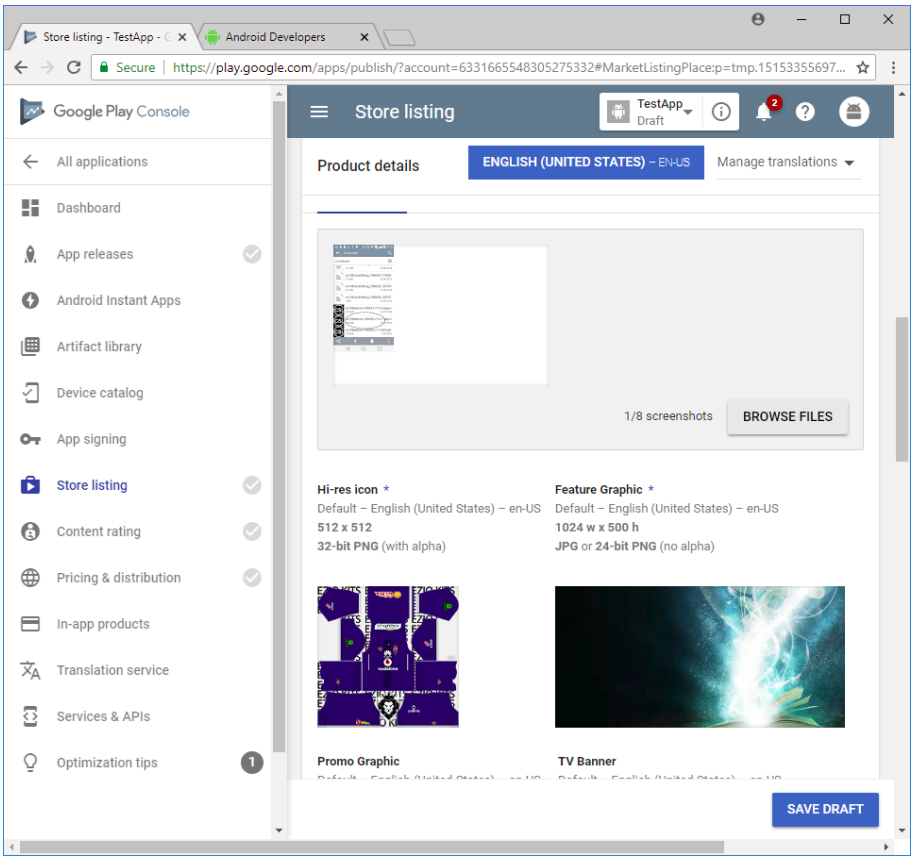


21. Select “Add high-res icons Drop image here” in ‘Hi-res icon’ section to select the picture with resolution 512x512.

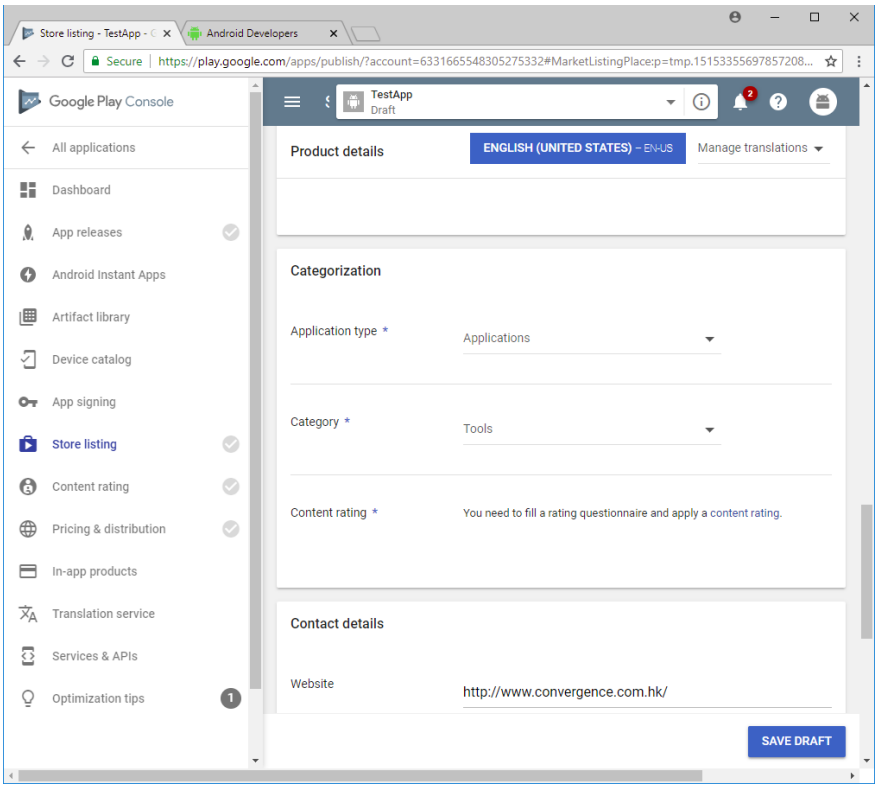


22. Select ‘Add feature graphic. Drop image here’ icon in ‘Feature Graphic’ section to select the picture with resolution 1024x500.

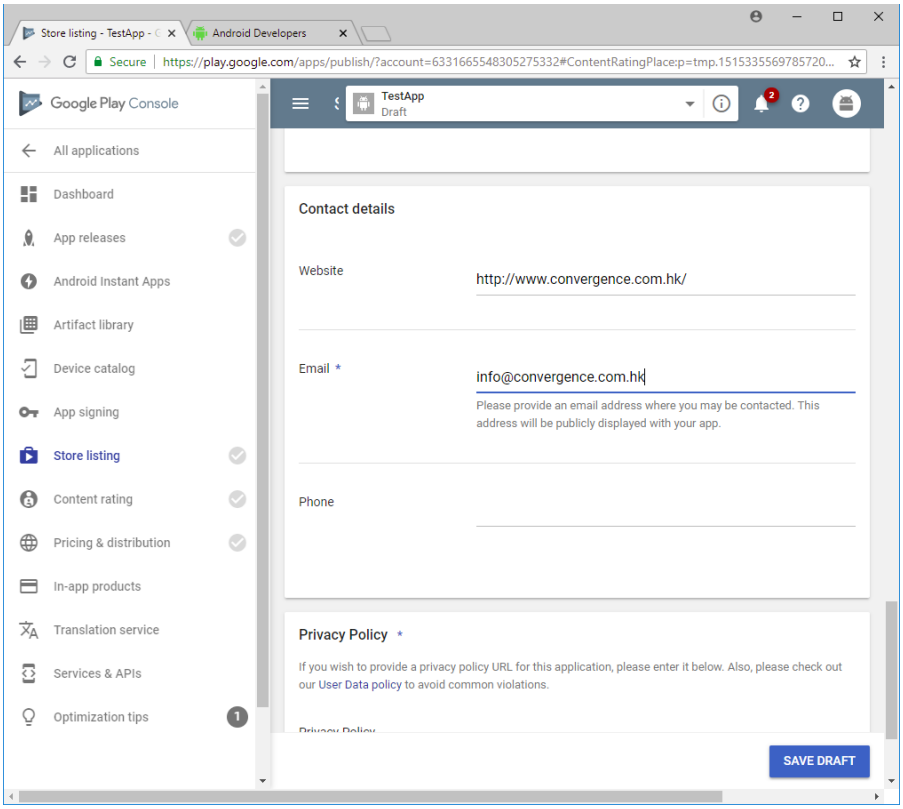




23. Go downwards to the ‘Categorization’ section. Select ‘Application type’, ‘Category’’ and then ‘content rating’.



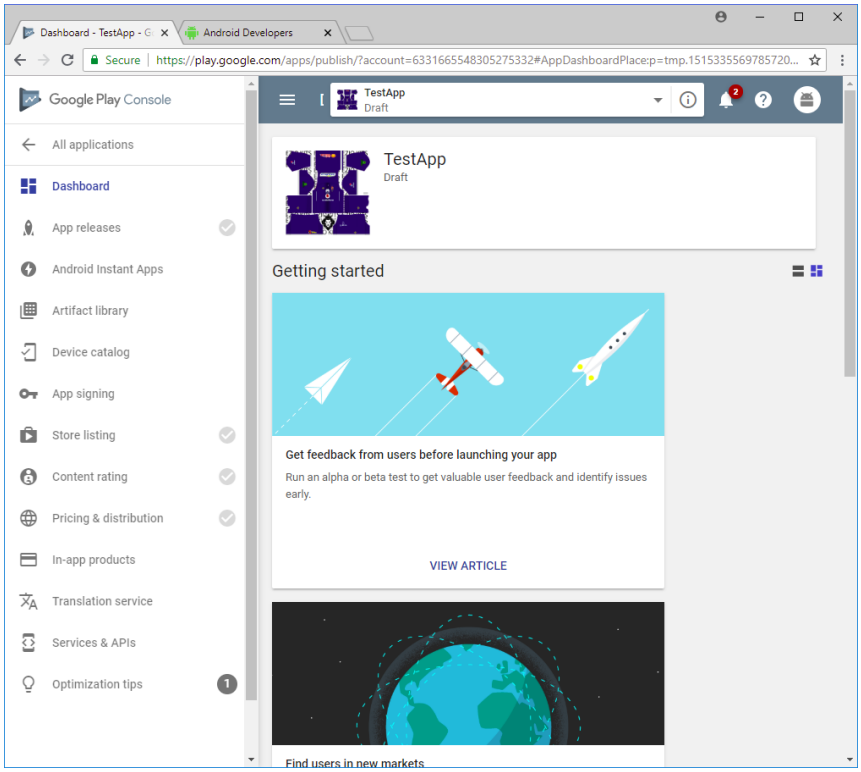
24. Go downwards to ‘Contact details’ and input ‘Email’ information



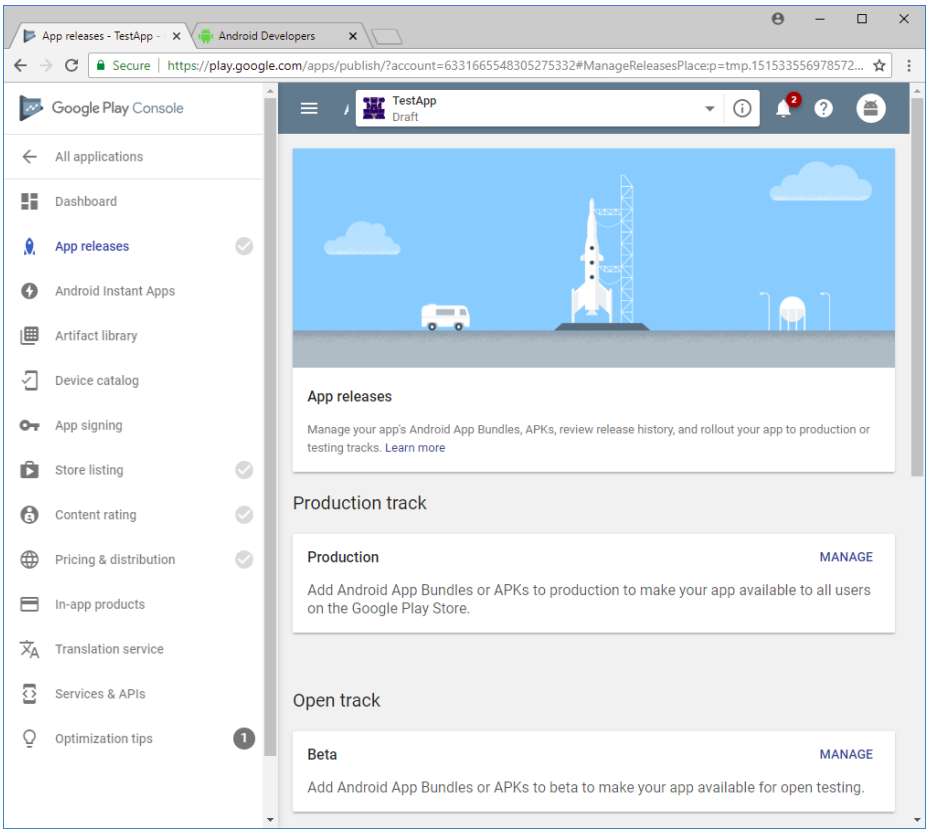
25. Tick “Not submitting a privacy policy URL …” in the “Privacy Policy’ section.

26. Press ‘Save Draft’

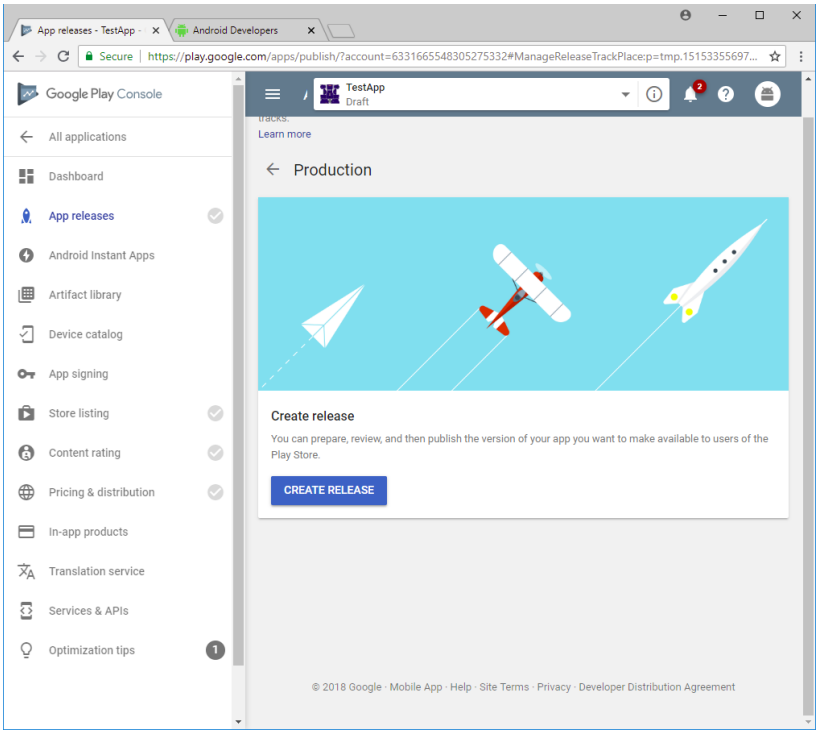
27. File publish: within google play console. Assume the application is created. Select the application, such as ‘TestApp’



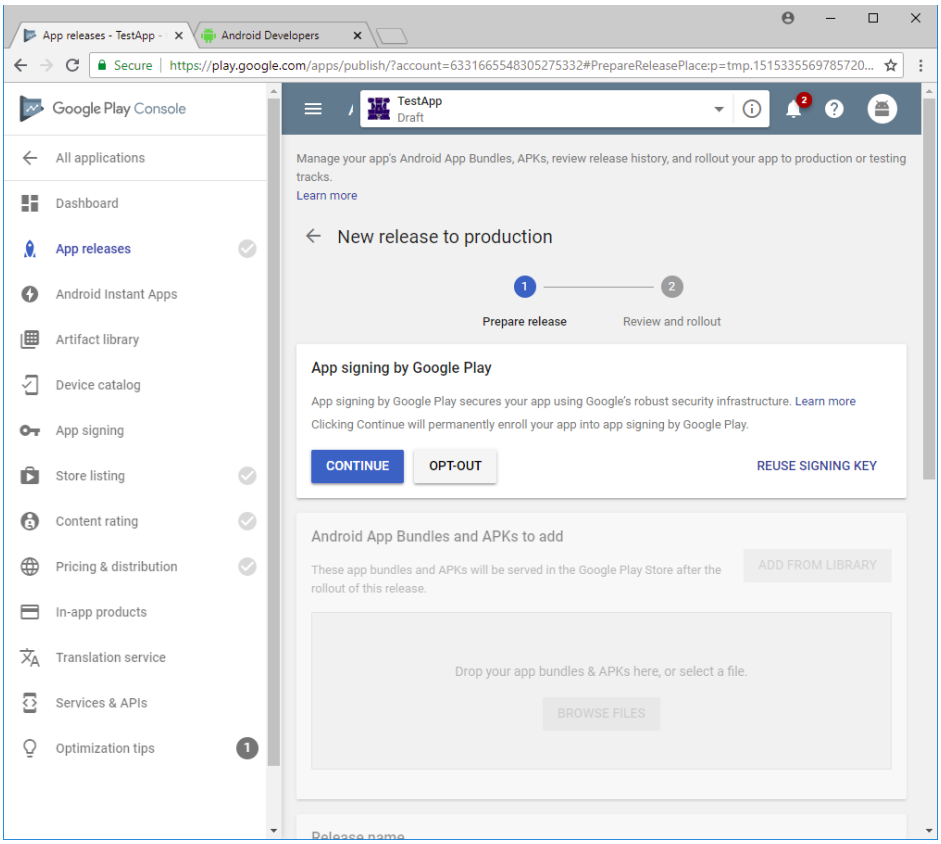
28. Select ‘App releases’ on the left hand side



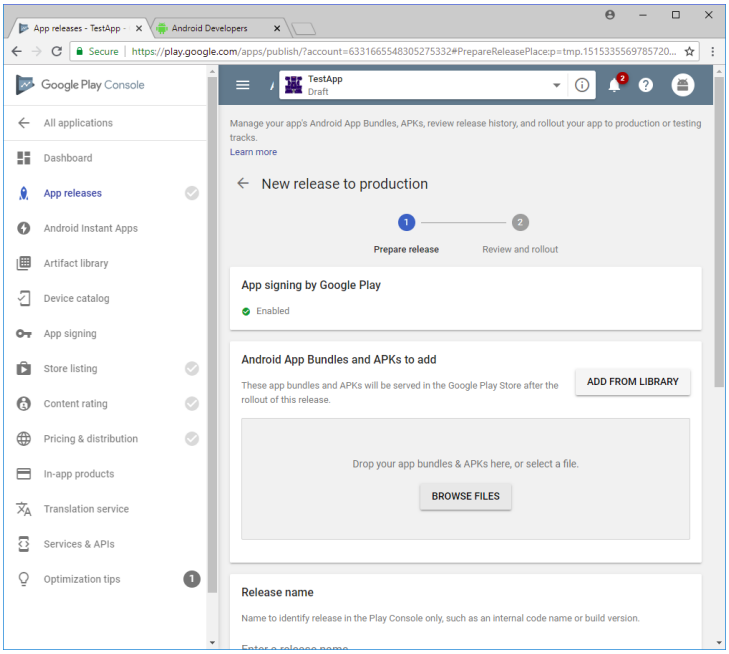
29. Select ‘Manage’ in ‘Production track’ -> ‘Production’ section



30. Select ‘Create Release’



31. Select 'Continue'



32. Select 'Browse files' to select the signed APK file built previously.

33. Select 'Review' …. To finally publish the APK

34. Apk installation from Google play: execute “Play” apps. Search and install your android apps.
35. End

3.7 CS108 Android Demo App Classes

***** Note: the following information is updated as per Android Demo App 2.6.0**

cs108ademoapp classes

Class name	Description
AccessTask	The class handles the AsyncTask to do RFID access operation
AccessTask1	The class is a superclass of AccesTask. It adds access retry, text formatting and deformatting and others.
CustomIME	The class handles the custom IME for keyboard wedge feature
CustomMediaPlayer	The class handles the custom media player to output sound
CustomPopupWindow	The class handles the custom popup window to display message
CustomProgressDialog	The class handles the custom progress dialog that are used for all Spinner UI component.
DrawerListContent	The class defines the drawer item list
GenericTextWatcher	The class handles the custom EditText UI component
InventoryBarcodeTask	The class handles the AsyncTask to do barcode inventory
InventoryRfidTask	The class handles the AsyncTask to do RFID inventory
MainActivity	This class is the entry point of the application
SaveList2ExternalTask	The class handles the task to save data to external files
SelectTag	The class handles the tag selected for further action (first used in AuraSense)
SensorConnector	The class handles the task to access phone sensor data, such as GPS and E-Compass.
SettingTask	The class handles the AsyncTask to do RFID setting operation
SharedObjects	This class stores the shared data of the application.

Fragment classes are called from MainActivity.

Fragment Class name	Description
AboutFragment	The class handles the ‘About’ page UI
AccessAuraSenseFragment	The class handles the ‘configuration’ tab UI of ‘AuraSense’ page
AccessColdChainFragment	The class handles the ‘logging’ tab UI with ‘uEm4325’ page.
AccessConfigFragment	The class handles the configuration data selection after Axzon/Magnus tag type selection and before going to AccessMicronFragment
AccessEm4325PassiveFragment	The class handles the ‘One-shot’ tab UI of ‘uEm4325’ page

AccessFdmicroFragment	The class handles the ‘configuration’ tab UI of ‘FM13DT160’ page
AccessImpinjFragment	The class handles the ‘configuration’ tab UI of ‘Impinj FastID’ page
AccessMicronFragment	The class handles the ‘configuration’ tab UI with ‘Axzon Magnus’ page.
AccessReadWriteFragment	The class handles the ‘Read/Write’ page UI
AccessReadWriteUserFragment	The class handles the ‘Large Sized memory read’ page UI
AccessRegisterFragment	The class handles the ‘Register Tag’ page UI
AccessSecurityFragment	The class handles the ‘Security’ page UI
AccessSecurityKillFragment	The class handles the ‘Kill’ tab UI within ‘Security’ page
AccessSecurityLockFragment	The class handles the ‘Lock’ tab UI within ‘Security’ page
AccessUcode8Fragment	The class handles the ‘configuration’ tab UI of ‘Ucode 8’ page
AccessUcodeFragment	The class handles the ‘configuration’ tab UI of ‘Ucode Dna’ page
AccessXerxesLoggerFragment	The class handles the ‘Logger’ tab UI of ‘Axzon’ page
AesCmac	The class handle encryption and decryption in the AccessUcodeFragment class
AuraSenseFragment	The class handles the ‘AuraSense’ page UI within ‘Special Functions’ page.
AxzonFragment	The class handles the ‘Axzon’ page UI within ‘Special Functions’ page.
AxzonSelectorFragment	The class handles the tag selection after selecting ‘Axzon’ or ‘Axzon Magnus’ within ‘Special Functions’ page and before going to AccessConfigFragment /AxzonFragment /MicronFragment
ColdChainFragment	The class handles the ‘Cold Chain CS8300’ page UI within ‘Special Functions’ page.
CommonFragment	The class is the base class of all fragment classes
ConnectionFragment	The class handles the ‘Connection’ page UI
FdmicroFragment	The class handles the ‘FM13DT160’ page UI
HomeFragment	The class handles the ‘Main’ page UI
HomeSpecialFragment	The class handles the ‘Special Functions’ page UI
ImpinjFragment	The class handles the ‘Impinj FastID’ page UI within ‘Special Functions’ page.
InventoryBarcodeFragment	The class handles the ‘Barcode’ tab UI of the ‘Inventory’ page.
InventoryFragment	The class handles the ‘Inventory’ page UI
InventoryRfidMultiFragment	The class handles the ‘RFID’ tab UI of the ‘Inventory’ page. The class also handles the

	'Multi-bank inventory' page UI within 'Special Functions' page.
InventoryRfidSearchFragment	The class handles the 'Geiger Search' page UI
MicronFragment	The class handles the 'Axzon Magus' page UI within 'Special Functions' page.
SettingAdminFragment	The class handles the 'Administration' tab of the 'Settings' page
SettingFilterFragment	The class handles the 'Filter' page UI
SettingFilterPostFragment	The class handles the "Post-Filter' tab UI within 'Filter' page
SettingFilterPreFragment	The class handles the "Pre-Filter' tab UI within 'Filter' page
SettingFilterRssiFragment	The class handles the "Rssi-Filter' tab UI within 'Filter' page
SettingFragment	The class handles the 'Settings' page UI
SettingOperateFragment	The class handles the 'Operation' tab of the 'Settings' page
Ucode8Fragment	The class handles the 'Ucode 8' page UI within 'Special Functions' page.
UcodeFragment	The class handles the 'Ucode Dna' page UI within 'Special Functions' page.
UtraceFragment	The class handles the 'untrace' page UI

Chapter 4: Library Class and Method

Class Name: com.csl.cs108Library4A

This library class provides some high-level function calls for CS108 Android Demo App. The description is updated for library cs108library4a version 2.6.0.

Public Constants

OperationTypes	TAG_RDOEM, TAG_INVENTORY_COMPACT, TAG_INVENTORY, TAG_SEARCHING
HostCmdResponseTypes	TYPE_UPLINK_RESPONDED, TYPE_UPLINK1_RESPONDED, TYPE_RFID_DATA, TYPE_BARCODE_DATA, TYPE_BARCODE_GOODREAD, TYPE_NOTIFICATOIN_ERRORCODE, TYPE_COMMAND_BEGIN, TYPE_COMMAND_END, TYPE_18K6C_INVENTORY, TYPE_18K6C_INVENTORY_COMPACT, TYPE_18K6C_TAG_ACCESS, TYPE_ANTENNA_CYCLE_END, TYPE_COMMAND_ACTIVE, TYPE_ERRORCODE, TYPE_BARCODE_INVENTORY
HostCommands	NULL, *CMD_RDOEM*, *CMD_WROEM*, CMD_ENGTEST, CMD_MBPRDREG, CMD_MBPWRREG, *CMD_18K6CINV*, *CMD_18K6CREAD*, *CMD_18K6CWRITE*, *CMD_18K6CLOCK*, *CMD_18K6CKILL*, *CMD_18K6CBLOCKWRITE*, *CMD_UPDATELINKPROFILE* *CMD_AUTHENTICATE,* *CMD_READBUFFER,* *CMD_UNTRACEABLE*

CsvColumn	RESERVE_BANK, EPC_BANK, TID_BANK, USER_BANK, PHASE, CHANNEL, TIME, TIMEZONE, LOCATION, DIRECTION, OTHERS
	INVALID_STATUS
	INVALID_BACKPORT INVALID_CODESENSOR INVALID_CODERSSI INVALID_SENSORDATA INVALID_CODETEMPC
	iNO_SUCH_SETTING
	dBuV_dBm_constant

Public data classes

ReaderDevice	ReaderDevice(String name, String address, boolean selected, String details, String strPc, String strXpc, String strCrc16, String strMdid, String strExtra1, int extra1Bank, int extra1Offset, String strExtra2, int extra2Bank, int extra2Offset, String strTimeOfRead, String strTimeZone, String strLocation, String strCompass, int count, double rssi, int phase, int channel, int port, int status, int backPort1, int backPort2, int codeSensor, int codeRssi, float codeTempC, String brand, int sensorData)	Initalise a tag/device data record
	ReaderDevice(BluetoothDevice bluetoothDevice, String name, String address, 87oolean selected, String details, int count, double rssi)	Initalise a tag data/device record
	String getName()	Get name of data record
	void setName(String name)	Set name of data record
	String getAddress()	Get address of data record
	void setAddress(String address)	Set address of data record

	boolean getSelected()	Get selected status of the data record
	void setSelected(boolean selected)	Set selected status of the data record
	int compareTo(ReaderDevice other)	Compare routine for sorting sharedObjects
	String getDetails()	Get details of data record
	void setDetails(String details)	Set details of data record
	String getPc()	Get Pc of data record
	String getXpc()	Get Xpc of data record
	setXpc(String strXpc)	Set Xpc of data record
	String getRes()	Get Res of data record
	String getRes2()	Get Res2 of data record
	String getEpc()	Get Epc of data record
	String getTid()	Get Tid of data record
	String getUser()	Get User of data record
	String getMdid()	Get Mdid of data record
	int getCount()	Get count of data record
	void setCount(int count)	Set count of data record
	double getRssi()	Get rssi of data record
	void setRssi(double rssi)	Set rssi of data record
	int getPhase();	Get phase of data record
	void setPhase(int phase)	Set phase of data record
	int getChannel()	Get channel of data record
	void setChannel(int channel)	Set channel of data record
	int getPort()	Get port of data record
	void setPort(int port)	Set port of data record
	int getStatus()	Get status of data record
	void setStatus(int status)	Set status of data record
	int getBackport1()	Get backport1 of data record
	void setBackport1(int backport1)	Set backport1 of data record
	int getBackport2()	Get backport2 of data record
	void setBackport2(int backport1)	Set backport2 of data record
	int getCodeSensor()	Get codesensor of data record
	setCodeSensor(int codeSensor)	Set codesensor of data record
	int getCodeSensorMax()	Get codesensorMax of data record
	setCodeSensorMax(int codeSensorMax)	Set codesensorMax of data record
	int getCodeRssi()	Get CodeRssi of data record

	void setCodeRssi(int codeRssi)	Set CodeRssi of data record
	float getCodeTempC()	Get CodeTempC of data record
	void setCodeTempC(float codeTempC)	Set CodeTempC of data record
	String getBrand()	Get Brand of data record
	void setBrand(String brand)	Set Brand of data record
	int getSensorData()	Get SensorData of data record
	void setSensorData(int sensorData)	Set SensorData of data record
	void setExtra(String strExtra1, int extra1Bank, int extra1Offset, String strExtra2, int extra2Bank, int extra2Offset)	Set ExtraData of data record
	String getstrExtra1()	Get the string of extra bank 1
	setExtra1(String strExtra1, int extra1Bank, int extra1Offset)	Set the string of extra bank 1
	String getstrExtra2()	Get the string of extra bank 2
	setExtra2(String strExtra2, int extra2Bank, int extra2Offset)	Set the string of extra bank 2
	boolean isConnected()	Check connection status of data record
	void setConnected(boolean isConnected)	Set connection status of data record
	String getTimeOfRead()	Get TimeOfRead of data record
	String getTimeZone ()	Get TimeZone of data record
	String getLocation ()	Get Location of data record
	void setLocation(String location)	Set Location of data record
	String getCompass ()	Get Compass of data record
	void setCompass(String compass)	Set Compass of data record
Cs108Connector.Cs108ScanData	BluetoothDevice device	Scanned device object
	int rssi	device rssi
	byte[] scanRecord	advertisement data
	BluetoothDevice getDevice()	Get device object
	String getName()	Get device name
	String getAddress()	Get device address

	byte[] getScanRecord()	Get the device advertisement data
Cs108Connector.Rx000pkgData	HostCmdResponseTypes responseType	Rx000 response package type
	int flags	Rx000 response flag byte
	byte[] dataValues	Rx000 response package data
	long decodedTime	decoded time field within response data
	double decodedRssi	decoded rssi field within response data
	int decodedPhase	decoded phase field within response data
	int decodedChidx	decoded channel index field within response data
	int decodedPort	decoded port field within response data
	byte[] decodedPc	decoded PC field within response data
	byte[] decodedEpc	decoded EPC field within response data
	byte[] decodedCrc	decoded CRC field within response data
	byte[] decodedData1	Decoded data1 field within response data
	byte[] decodedData2	Decoded data2 field within response data
	String decodedResult	Decoded string available for user application if Ok
	String decodedError	Debug string to be displayed for user application if eror
Cs108Connector.Rx000EngSetting	int getwideRSSI()	Get the wideband RSSI of the environment
	int getnarrowRSSI()	Get the narrowband RSSI of the environment
	void resetRSSI()	Reset RSSI of the environment read

Public data

int invalidate	The number of invalid data received during RFID inventory
int validate	The number of valid data received during RFID inventory

int mRfidDevice.mRx000Device.invalidUpdata	The number of inventory package that cannot be decoded.

Public constructors

Cs108Library4A(Context context, TextView mLogView)	Initialise the class with parameters: Context: context, such as getActivity(), of the calling object mLogView: the textView in the calling object for debugging purpose.

Public interfaces

NotificationListener	Callback for the trigger button press or release

Public methods

General:

String getlibraryVersion()	Get the version of library
boolean checkHostProcessorVersion(String version, int majorVersion, int minorVersion, int buildVersion)	check if the version is above specific version values.
void appendToLogView(String s)	Show the debug string to the EditText of the right hand side drawer.
void appendToLog(String s)	Show the debug string to the android studio LogCat window
String byteArrayToString(byte[] packet)	Convert the byte array to String
float decodeCtesiusTemperature(String strActData, String strCalData)	Decode the temperature in degree C from the CTesisu tag action data and calibration data
float decodeMicronTemperature(int iTag35, String strActData, String strCalData)	Decode the temperature in degree C from different Micron tag action data and calibration data
String strFloat16toFloat32(String strData)	Change the 16bit float data to normal 32bit float data
String str2float16(String strData)	Change the string to 16bit float data
float temperatureC2F (float fTemp)	Convert temperature from degree C to F
String temperatureC2F (String strValue)	Convert temperature from degree C to F
String temperatureF2C (String strValue)	Convert temperature from degree F to C
void setSameCheck(boolean sameCheck1)	set if parameter setting check is same as stored value and skips repeated storage

void saveSetting2File()	save the user configurable parameters to file.
int getRssiDisplaySetting()	Get the rssi display type with output: 0 for dBuV, 1 for dBm
boolean setRssiDisplaySetting(int rssiDisplaySelect)	Set the rssi display type with parameter: 0 for dBuV, 1 for dBm
byte getPopulation2Q(int population)	get the Q value from population
int getPopulation()	get the tag population set
boolean setPopulation(int population)	set the tag population
public byte getQValue()	get the Q Value to be set
boolean setQValue(byte byteValue)	set the Q value
int getBeepCount()	Get beep delay count for tag received
boolean setBeepCount(int beepCount)	set beep delay count for tag received
boolean getInventoryBeep()	Get if beep is needed for RFID inventory
boolean setInventoryBeep(boolean inventoryBeep)	Set if beep is needed for RFID inventory with parameter: true for enable, false for disable
boolean getInventoryVibrate()	Get if vibrator is needed for RFID inventory
boolean setInventoryVibrate(boolean inventoryVibrate)	Set if vibrator is needed for RFID inventory with parameter: true for enable, false for disable
int getVibrateModeSetting()	Get the vibrator operation mode with output: 0 for vibrate for new tag, 1 for vibrate for all tag
boolean setVibrateModeSetting(int vibrateModeSelect)	Get the vibrator operation mode with parameter: 0 for vibrate for new tag, 1 for vibrate for all tag
int getVibrateTime()	Get vibration time in ms for RFID inventory
boolean setVibrateTime(int vibrateTime)	Set vibration time in ms for RFID inventory
int getVibrateWindow()	Get the vibration window in second for RFID inventory
boolean setVibrateWindow(int vibrateWindow)	set the vibration window in second for RFID inventory
boolean setVibrateOn(boolean on)	turn the vibrator on or off parameter: on: true for on. False for off.
boolean getSaveFileEnable()	Get if inventory data is saved to external file
boolean setSaveFileEnable(boolean saveFileEnable)	Set if inventory data is saved to external file with parameter: true for enable, false for disable
boolean getSaveCloudEnable()	Get if inventory data is saved to cloud server
boolean setSaveCloudEnable(boolean saveCloudEnable)	Set if inventory data is saved to cloud server with parameter: true for enable, false for disable

boolean getSaveNewCloudEnable()	Get if inventory NEW data is saved to cloud server
boolean setSaveNewCloudEnable(boolean saveNewCloudEnable)	Set if inventory NEW data is saved to cloud server with parameter: true for enable, false for disable
boolean getSaveAllCloudEnable()	Get if inventory ALL data is saved to cloud server
boolean setSaveAllCloudEnable(boolean saveNewCloudEnable)	Set if inventory ALL data is saved to cloud server with parameter: true for enable, false for disable
String getServerLocation()	Get the cloud server location
boolean setServerLocation(String serverLocation)	Set the cloud server location
int getServerTimeout()	Get the cloud connection timeout in second
boolean setServerTimeout(int serverTimeout)	Set the cloud connection timeout in second
int getSavingFormatSetting()	Get the saving format
boolean setSavingFormatSetting(int savingFormatSelect)	Set the file saving format
int getCsvColumnSelectSetting()	Get columns selected in csv format
boolean setCsvColumnSelectSetting(int csvColumnSelect)	Set the columns selected in csv format
boolean getTriggerReporting()	Check if trigger auto reporting is enabled
boolean setTriggerReporting(boolean triggerReporting)	Enable/Disable trigger auto reporting
short getTriggerReportingCount()	Get the period of trigger auto reporting
boolean setTriggerReportingCount(short triggerReportingCount)	Set the period of trigger auto reporting
boolean setAutoTriggerReporting(byte timeSecond)	Set the period of trigger auto reporting
boolean stopAutoTriggerReporting()	Stop trigger auto reporting
String checkVersion()	Check different firmware versions.
int getTriggerCount()	Get the number of trigger received
String deformatWriteAccessData(String strIn)	Routine to deformat the format in

Bluetooth related:

String getBluetoothICFirmwareVersion()	get the bluetooth firmware version in string, in sequence of major, minor and build versions separated by dot character.
String getBluetoothICFirmwareName()	get the bluetooth name
boolean setBluetoothICFirmwareName(String name)	set the bluetooth name

boolean isBleScanning()	check if scanning bluetooth devices. Return: true implies scanning
boolean scanLeDevice(final boolean enable)	Start/stop scanning Bluetooth devices with parameters: enable: true to start scanning. False to stop scanning
boolean isBleConnected()	check if the Bluetooth is connected return: true implies connected.
boolean connect(ReaderDevice readerDevice)	start Bluetooth connection with parameter: readerDevice: the selected scanned bluetooth device
void disconnect(boolean tempDisconnect)	start bluetooth disconnection with parameter: tempDisconnect: true to disconnect temporarily. False to disconnect permanently.
boolean forceBTdisconnect()	Start bluetooth disconnection immediately
String getBluetoothDeviceAddress()	get the mac address of the connected bluetooth device
String getBluetoothDeviceName()	get the name of the connected bluetooth device
int getRssi()	get the rssi signal strength of the bluetooth connection in unit –dbm.
long getStreamInRate()	get the data rate of CS108 coming data in byte per second.
~~**boolean getConnectionHSpeed()**~~	~~check if high speed connection is used~~
~~**boolean setConnectionHSpeed(boolean on)**~~	~~set high speed connection~~
Cs108ScanData getNewDeviceScanned()	Get new scanned device information with output: null for nothing.

Host Processor Firmware related:

String getHostProcessorICSerialNumber()	get the serial number of the reader
String getHostProcessorICBoardVersion()	get the main board version
String hostProcessorICGetFirmwareVersion()	Get the Firmware version of the host processor

Notification related:

boolean batteryLevelRequest()	request to update the battery level immediately. Return: true for success request.
boolean setBatteryAutoReport(boolean on)	set automatic battery reporting
boolean setAutoRFIDAbort(boolean enable)	set automatic RFID inventory Abort
boolean getAutoRFIDAbort ()	Get status of automatic RFID inventory Abort
boolean setAutoBarStartSTop (boolean enable)	set automatic Barcode start/stop
boolean getAutoBarStartSTop ()	Get the status of automatic Barcode start/stop
int getBatteryLevel()	get the latest battery level received from the cs108.
String getBatteryDisplay(boolean voltageDisplay)	Get the display information about battery status with parameter: true for voltage display. False for percentage display
public String isBatteryLow()	Check if battery is low. If output string is null, Ok. Otherwise, it shows the battery level percentage.
int getBatteryCount()	get the battery reported index which is used to check if battery is updated.
int getBatteryDisplaySetting()	get the battery display type. 0 for voltage display, 1 for percentage display
boolean setBatteryDisplaySetting(int batteryDisplaySelect)	set the battery display type with parameters: 0 for voltage display, 1 for percentage display
boolean getTriggerButtonStatus()	get the latest trigger button status received from the cs108.
void setNotificationListener(NotificationListener listener)	set the listener routine for the trigger button.
byte[] onNotificationEvent()	Read the RFID uplink data

Barcode detector related:

boolean isBarcodeFailure()	check if barcode module is failure
String getBarcodeSerial()	get the serial number of the barcode module
boolean getBarcodeOnStatus()	get the on status of the barcode device
boolean setBarcodeOn(boolean on)	turn the barcode detector on or off parameter: on: true for on. False for off.

boolean barcodeSendCommandTrigger()	send command data to set trigger mode in the barcode module
boolean barcodeSendCommandSetPreSuffix()	send command data to set a pre-defined prefix and suffix in the barcode module
boolean barcodeSendCommandResetPreSuffix()	send command data to clear the prefix and suffix in the barcode module
getBarcodePreSuffix()	Start to get the prefix and suffix string of the barcode module
void getBarcodeReadingMode()	Start to get the reading mode of the barcode module
boolean barcodeSendCommandConinuous()	send command data to set continuous mode
boolean barcodeInventory(boolean start)	start/stop barcode inventory
byte[] onBarcodeEvent()	Get new barcode inventoried information with output: null for nothing.
String getBarcodeVersion()	Get barcode firmware version
String getBarcodeESN()	Get ESN of barcode
String getBarcodeDate()	Get firmware date of the barcode

RFID detector related:

boolean getRfidOnStatus()	check if RFID detector is on or off. Return: true if on
boolean setRfidOn(boolean onStatus)	turn RFID detector on or off parameter: onStatus: true to turn on. False to turn off.
boolean isRfidFailure()	check if barcode module is failure
int mrfidToWriteSize()	get the length of the data queuing to send to RFID detector.
void mrfidToWritePrint()	For debugging purpose, print out the data queue to be sent to RFID detector.
String getRadioSerial()	get the serial number of the radio module
String getRadioBoardVersion()	get the board version of the radio module
String getMacVer()	get the Mac version in string, in sequence of major, minor and build version, separated by dot character.
String getModelNumber()	get the model number of the radio module

int getcsModel()	Get the csModel number: 108 for Cs108, 463 for Cs463
int getPortNumber()	Get the number of Port for the csModel
String getSerialNumber()	get serial number information from OEM
void macWrite(int address, int value)	Write data to mac register of rfid module
public void setReaderDefault()	Set default CS108 default data
void set_fdCmdCfg(int value)	void set_fdCmdCfg(int value)
void set_fdRegAddr(int addr)	void set_fdRegAddr(int addr)
void set_fdWrite(int addr, long value)	void set_fdWrite(int addr, long value)
void set_fdPwd(int value)	void set_fdPwd(int value)
void set_fdBlockAddr4GetTemperature(int addr)	void set_fdBlockAddr4GetTemperature(int addr)
void set_fdReadMem(int addr, long len)	void set_fdReadMem(int addr, long len)
void set_fdWriteMem(int addr, int len, long value)	void set_fdWriteMem(int addr, int len, long value)
void setImpinJExtension(boolean tagFocus, boolean fastId)	void setImpinJExtension(boolean tagFocus, boolean fastId)
~~**long getMacLastCommandDuration**~~	~~Get the time stamp of the last mac access command with parameter Request: true for immediate, false for previous stored value~~
int getAntennaSelect()	Get the antenna port selected for the csModel
boolean setAntennaSelect(int number)	Set the antenna port selected for the csModel
boolean getAntennaEnable()	Get the antenna enable status for the csMode
boolean setAntennaEnable(boolean enable)	Enable/Disable the antenna for the csModel
int getAntennaCycle()	get the antenna cycle value
boolean setAntennaCycle(int antennaCycle)	set the antenna cycle value parameter: antennaCycle from 1 to 65535
boolean setAntennaInvCount(long antennaInvCount)	set the antenna inventory count value from 0 to 0xffffffff
long getAntennaDwell()	get the antenna dwell time
boolean setAntennaDwell(long antennaDwell)	set the antenna dwell time parameter: antennaDwell in unit of 1ms.

long getPwrlevel()	get the antenna power level
boolean setPowerLevel(long pwrlevel)	set the antenna power level parameter: pwrlevel in unit of 0.1dbm, up to 300.
int getQueryTarget()	get the query target value set for inventory.
int getQuerySession()	get the query session value set for inventory.
int getQuerySelect()	get the query select value set for inventory.
boolean setTagGroup(int sL, int session, int target1)	set query group parametes parameters: sL: set the query select value for the inventory. From 0 to 3. Session: set the query session for the inventory. From 0 to 3 Flag: set the query target for the inventory. 0 for A. others for B.
int getTagFocus()	get the tag focus value set for inventory.
boolean setTagFocus(boolean tagFocusNew)	set the tag focus value set for inventory.
boolean setInvBrandId(boolean invBrandId)	Set the brand ID for brand checking of the tag information.
boolean getInvAlgo()	get the query algorithm set for the inventory.
boolean setInvAlgo(boolean dynamicAlgo)	set the query algorithm for the inventory. Parameter: invAlgo: false implies fixed. True implies dynamic algorithm.
List<String> getProfileList()	Get the list of available profiles
int getCurrentProfile()	get the query profile set for the inventory.
boolean setCurrentLinkProfile(int profile)	set the query profile for the inventory. Profile: 0 to 3. **See Appendix A for details of the 4 profiles**
String getEnvironmentalRSSI()	Get the environmental RSSI read in the RFID module.
void resetEnvironmentalRSSI()	Reset the environmental RSSI read in the RFID module.
int getHighCompression()	Get High Compression value for inventory

int getRflnaGain()	Get RF LNA Gain value for inventory
int getIflnaGain ()	Get IF LNA Gain value for inventory
int getAgcGain ()	Get AGC Gain value for inventory
int getRxGain ()	Get RX Gain value for inventory
boolean setRxGain(int highCompression, int rflnagain, int iflnagain, int agcgain)	Set HighCompression, RF LNA Gain, IF LNA Gain, AGC Gain values for inventory
boolean setRxGain(int rxGain)	Set only Rx Gain values for inventory
byte getTagDelay()	get the tag delay time (in ms) before next tag coming.
boolean setTagDelay(byte tagDelay)	set the tag delay before next tag coming in unit of ms.
long getCycleDelay()	get the tag delay before running next inventory cycle in unit of ms
boolean setCycleDelay(long cycleDelay)	set the tag delay before running next inventory cycle in unit of ms
void getAuthenticateReplyLength()	get the length of the authentication reply data
boolean setTam1Configuration(int keyId, String matchData)	Set the Tam1 data for the tam1 authentication check
boolean setTam2Configuration(int keyId, String matchData, int profile, int offset, int blockId, int protMode)	Set the Tam2 data for the tam2 authentication check
String getAuthMatchData()	get the authentication match data
boolean setAuthMatchData(String mask)	set the authentication match data
int getUntraceableEpcLength()	get the length of the untraceable Epc
boolean setUntraceable(boolean bHideEpc, int ishowEpcSize, int iHideTid, boolean bHideUser, boolean bHideRange)	set the untraceable parameters
boolean setUntraceable(int range, boolean user, int tid, int epcLength, boolean epc, boolean uxpc)	set the untraceable parameters
int getStartQValue()	get the start Q value set for dynamic algorithm.
int getMaxQValue()	get the maximum Q value set for dynamic algorithm.
int getMinQValue()	get the minimum Q vale set for dynamic algorithm.
int getRetryCount()	get the retry count set for dynamic algorithm.
boolean setRetryCount(int retryCount)	Set the retry count set for dynamic algorithm.

boolean setDynamicQParms(int startQValue, int minQValue, int maxQValue, int retryCount)	set the parameters for dynamic algorithm paramters: startQValue: start Q from 0 to 15. minQValue: minimum Q from 0 to 15 maxQValue: maximum Q from 0 to15 retryCount: retry count from 0 to 255
int getFixedQValue()	get the fixed Q value set for fixed algorithm.
int getFixedRetryCount()	get the retry count set for the dynamic alogorithm.
boolean getRepeatUnitNoTags()	check if repeat to run until no tag for fixed algorithm.
boolean setFixedQParms(int qValue, int retryCount, boolean repeatUnitNoTags)	set the parameters for fixed algorithm. Paramters: qValue: the Q value for fixed algorithm. retryCount: the retry count for the fixed algorithm. repeatUnitNoTags: true to repeat until no tag in fixed algorithm.
public int getInvSelectIndex()	get the inventory select index
boolean getSelectEnable()	get the enable status of the inventory select index.
int getSelectTarget()	get the target selected for the inventory select index.
int getSelectAction()	get the action selected for the inventory select index.
int getSelectMaskBank()	get the mask bank for the inventory select index.
int getSelectMaskOffset()	get the mask offset for the inventory select index.
String getSelectMaskData()	get the mask data for the inventory select index.
boolean setInvSelectIndex(int invSelect)	set inventory select index for the inventory select index. Parameter: invSelect from 0 to 7.
boolean setSelectCriteriaDisable()	Disable the select of the select index for inventory
boolean setSelectCriteria(int index, boolean enable, int target, int action, int bank, int offset, String mask, boolean maskbit)	set the select criteria parameters: enable: the enable status of the inventory select index.

	target: the target selected for the inventory select index. action: the action selected for the inventory select index. bank: the mask bank for the inventory select index. offset: the mask offset for the inventory select index. mask: the mask data for the inventory select index. maskbit: indicate the mask string is binary or hexadecimal String.
boolean setSelectCriteria(boolean enable, int target, int action, int bank, int offset, String mask)	set the select criteria parameters: enable: the enable status of the inventory select index. target: the target selected for the inventory select index. action: the action selected for the inventory select index. bank: the mask bank for the inventory select index. offset: the mask offset for the inventory select index. mask: the mask data for the inventory select index.
boolean setSelectCriteria(int index, boolean enable, int target, int action, int bank, int offset, String mask, int maskblen)	set the select criteria parameters: enable: the enable status of the inventory select index. target: the target selected for the inventory select index. action: the action selected for the inventory select index. bank: the mask bank for the inventory select index. offset: the mask offset for the inventory select index. mask: the mask data for the inventory select index. Maskblen: indicate valid bit of the mask string.
boolean getRssiFilterEnable()	Check if RSSI filtering is enabled or not
int getRssiFilterType()	Check the Filter type
int getRssiFilterOption()	Check the Filter Option

boolean setRssiFilterConfig(boolean enable, int rssiFilterType, int rssiFilterOption)	Set RSSI filtering parameters
double getRssiFilterThreshold1()	Get RSSI filter threshold 1
getRssiFilterThreshold2()	Get RSSI filter threshold 2
boolean setRssiFilterThreshold(double rssiFilterThreshold1, double rssiFilterThreshold2)	Set RSSI filter thresholds
long getRssiFilterCount()	Check RSSI filter count
setRssiFilterCount(long rssiFilterCount)	Set RSSI filter count
boolean getInvMatchEnable()	get the enable status set for post-filter
boolean getInvMatchType()	get the match type set for the post-filter.
int getInvMatchOffset()	get the match offset for the post-filter.
String getInvMatchData()	get the mask data for the post-filter.
boolean setPostMatchCriteria(boolean enable, boolean target, int offset, String mask)	set the post filter match criteria parameters: enable: the enable status set for post-filter target: the match type set for the post-filter.. True to filter matched ones. offset: the match offset for the post-filter. mask: the mask data for the post-filter
int getCountryNumberInList()	get logical channel number used for fixed channel usage.
String[] getCountryList()	Get the list of country selectable for the radio device.
boolean setCountryInList(int countryInList)	set the country in the selectable list for the radio device
boolean getChannelHoppingStatus ()	get frequency hopping order. 0 for hopping, 1 for fixed frequency.
boolean setChannelHoppingStatus(boolean channelOrderHopping)	Set frequency hopping order. 0 for hopping, 1 for fixed frequency.
boolean getChannelHoppingDefault()	check if frequency hopping is used
int getChannel()	get the channel used
boolean setChannel(int channelSelect)	select the channel to be used
int FreqChnCnt()	Get the number of the frequency used
double getLogicalChannel2PhysicalFreq(int channel)	get actual physical channel number from logical chnnnel number
boolean setInvModeCompact(boolean invModeCompact)	set inventory mode as compact mode if true, normal mode if false.
boolean setAccessBank(int accessBank)	set the access bank for access read/write operation.

boolean setAccessBank(int accessBank, int accessBank2)	set the access bank for the multi-bank inventory
boolean setAccessOffset(int accessOffset)	set the access offset for access read/write operation
boolean setAccessOffset(int accessOffset, int accessOffset2)	set the access offset for the multi-bank inventory
boolean setAccessCount(int accessCount)	set the access count for access read/write operation
boolean setAccessCount(int accessCount, int accessCount2)	set the access count for multi-bank inventory
boolean setAccessWriteData(String dataInput)	set the access data for the access write operation
boolean setTagRead(int tagRead)	set the number of extra banks read during normal/multi-bank inventory.
boolean setRx000KillPassword(String password)	set the kill password
boolean setRx000AccessPassword(String password)	set the access password
boolean setAccessRetry(boolean accessVerfiy, int accessRetry)	set the access retry parameters: accessVerfiy: need to verify or not after access accessRetry: number of retry if access failure
boolean setAccessLockAction(int accessLockAction, int accessLockMask)	set lock configuration for lock operation.
void restoreAfterTagSelect()	restore user configured parameter after selected operation
boolean setSelectedTagByTID (String strTagId, long pwrlevel)	set the selected tag to be selected or matched for the RFID operation with strTagId as the Tid string part.
boolean setSelectedTag(String strTagId, int selectBank, long pwrlevel)	set the selected tag to be selected or matched for the RFID operation. Paramter: strTagId: the Epc of the matching tag. selectBank: the bank of the matching tag. Pwrlevel: power level
boolean setMatchRep(int matchRep)	Set inventory repeat count for CS108
boolean setSelectedTag(String selectMask, int selectBank, int selectOffset, long pwrlevel, int qValue, int matchRep)	set the selected tag to be selected or matched for the RFID operation. Paramter: selectMask: the mask of the matching tag. selectBank: the bank of the matching tag

	selectOffset: the mask offset of matching tag. Pwrlevel: power level qValue: the qValue matchRep: the match repeat count
boolean startOperation(OperationTypes operationTypes)	start RFID detector operation. Parameter: operationTypes: operation type
boolean abortOperation()	stop the operation.
boolean sendHostRegRequestHST_CMD(HostCommands hostCommand)	set operation command to be executed in StartOperation command
boolean starAuthOperation()	start authentication operation.
Rx000pkgData onRFIDEvent()	Get new RFID inventoried tag information with output: null for nothing. Otherwise it returns the package data inventoried.

Chapter 5: Example Command Sequences

5.1 Introduction

This chapter gives some example sequences of commands of common operations on CS108

1. Scan and Connect Bluetooth
2. Start RFID Tag/Label Inventory (Simplest – using default configuration)
3. Start RFID Tag/Label Inventory (with non-default Configuration)
4. Start Barcode Inventory
5. Search an RFID Tag/Label (Geiger Search)
6. Read an RFID Tag/Label TID Bank
7. Write an RFID Tag/Label EPC Bank

5.2 Scan and Connect Bluetooth

1. scanLeDevice(true): start scanning
2. scanLeDevice(false): stop scanning
3. isBleScanning(): check if scanning
4. getNewDeviceScanned(): to get possible scanned device data
5. connect(readerDevice): connect with one of the readerDevice scanner
6. disconnect(false): disconnect the bluetooth connection.
7. isBleConnected(): check bluetooth connection

5.3 Start RFID Tag/Label Inventory using Default Configuration

1. startOperation(Cs108Library4A.OperationTypes.TAG_INVENTORY_COMPACT): start inventory
2. onRFIDEvent(): to get possible inventoried package data
3. abortOperation(): to stop inventory (do this when you are done reading RFID tags)

5.4 Start RFID Tag/Label Inventory using Non-Default Configuration

1. abortOperation(): to stop any previous RFID inventory and check RFID module health
2. setPowerLevel (300): Set Power = 300
3. setAntennaDwell(0): Set Antenna Dwell=0
4. setCurrentLinkProfile (1): Set Link Profile = 1
5. setTagGroup(0, 0, 0): Set select = all, Session = S0, target = A
6. setInvAlgo(3): Set Algorithm = Dynamic
7. setDynamicQParms(8, 0, 15, 0): Set Q = 8 for dynamic algorithm. setFixedQParms(8, 0, false): Q=8 for fixed algorithm
8. startOperation(Cs108Library4A.OperationTypes.TAG_INVENTORY): start inventory
9. onRFIDEvent(): to get possible inventoried package data
10. abortOperation(): to stop RFID inventory (do this when you are done reading RFID tags)

5.5 Start Barcode Inventory

1. setBarcodeOn(true): start barcode
2. barcodeInventory(true): start inventory
3. onBarcodeEvent(): get possible inventoried barcode data
4. barcodeInventory(false): stop inventory
5. setBarcodeOn(false): stop barcode (do this when you are done reading barcodes)

5.6 Search an RFID Tag/Label (Geiger Search)

1. abortOperation(): to stop any previous RFID inventory and check RFID module health
2. setSelectedTag("201700000000000000000001", 300): set target tag ID, such as 201700000000000000000001, and power = 300
3. setCurrentLinkProfile (1): Set Link Profile = 1
4. setTagGroup(0, 1, 2): Set select = all, Session = S1, target = A/B toggle
5. setInvAlgo(0): Set Algorithm = Fixed
6. setFixedQParms(0, 0, false): Q=0 for fixed algorithm
7. startOperation(Cs108Library4A.OperationTypes.TAG_INVENTORY): start inventory
8. onRFIDEvent(): to get possible inventoried package data
9. abortOperation(): to stop RFID inventory (do this when you are done reading RFID tags)

5.7 Read an RFID Tag/Label TID Bank

1. abortOperation(): to stop any previous RFID inventory and check RFID module health
2. setAccessBank(2): to access read/write TID bank, parameter 2 refers to Bank 2, i.e., TID bank
3. setAccessOffset(0): to access the offset 0 in word of the bank.
4. setAccessCount(1): to access 1 word in the bank, this is to read 1 word only
5. setRx000AccessPassword("0000"): to set the access password. "0000" means no password.
6. setAccessRetry(true, 7): to enable retry and set retry count as 7
7. setSelectedTag("201700000000000000000001", 1, 300): set target tag ID, such as 201700000000000000000001, bank=1, and power = 300
8. setCurrentLinkProfile (1): Set Link Profile = 1
9. setTagGroup(0, 1, 2): Set select = all, Session = S1, target = A/B toggle
10. setInvAlgo(0): Set Algorithm = Fixed
11. setFixedQParms(0, 0, false): Q=0 for fixed algorithm
12. sendHostRegRequestHST_CMD(CMD_18K6CREAD): to start read operation.
13. onRFIDEvent(): to get possible command response package data. The data to be read will come back in this Event.
14. abortOperation(): to stop RFID inventory (do this when you are done reading RFID tags)

5.8 Write an RFID Tag EPC Bank

1. abortOperation(): to stop any previous RFID inventory and check RFID module health
2. setAccessBank(1): to access read/write EPC bank. 1 means EPC bank.
3. setAccessOffset(2): to access the offset 2 in word of the bank
4. setAccessCount(1): to access 1 words (4 hex numbers) in the bank
5. setAccessWriteData("2018"): to set write data "2018" data (hex data) for write operation
6. setRx000AccessPassword("0000"): to set the access password. "0000" means no password.
7. setAccessRetry(true, 7): to enable retry and set retry count as 7
8. setSelectedTag("201700000000000000000001", 1, 300): set target tag ID, such as 201700000000000000000001, bank=1, and power = 300
9. setCurrentLinkProfile (1): Set Link Profile = 1
10. setTagGroup(0, 1, 2): Set select = all, Session = S1, target = A/B toggle
11. setInvAlgo(0): Set Algorithm = Fixed
12. setFixedQParms(0, 0, false): Q=0 for fixed algorithm
13. sendHostRegRequestHST_CMD(CMD_18K6CWRITE): to start write operation.
14. onRFIDEvent(): to get possible command response package data. decodedResult will come back if successful. decodedError will come back if failed.
15. abortOperation(): to stop RFID inventory (do this when you are done reading RFID tags)

Appendix A: Reader Modes (Link Profiles)

There are 4 link profiles in CS108: 0, 1, 2, 3. Only 1 profile is active at any time in CS108. The purpose of each link profile is explained below. These purposes correspond to different business and physical scenarios. The user should try out each profile to see which one gives best performance.

Reader Mode/ Link Profile	**0**	**1**	**2**	**3**
Purpose	Best Multipath Fading Resistance	Longest Read Range, Dense Reader Mode	Read Range and Throughput, Dense Reader Mode	Maximum Throughput
R-T Modulation	DSB-ASK	PR-ASK	PR-ASK	DSB-ASK
Tari (µs)	25.00	25.00	25.00	6.25
X	1.00	0.50	0.50	0.50
PW (Pulse Width in usec)	12.50	12.50	12.50	3.13
RTcal (usec)	75.00	62.50	62.50	15.63
TRcal (usec)	200.00	85.33	71.11	20.00
DR (Divide Ratio)	8	64/3	64/3	8
T-R Modulation	FM0	Miller-4	Miller-4	FM0
TRExt	1	1	1	1
Link Frequency(LF) (KHz)	40	250	300	400
Data Rate (Kbps)	40	62.5	75	400

Appendix B: Sessions

Session is a concept of EPC to allow a tag to respond to multiple readers inventorying it at the same time, each using a different session number.

There are 4 possible sessions: S0, S1, S2, S3.

The user however has to be careful because these 4 sessions have different behavior, notably how the tag flag "persist" in time. A tag, before inventory or when just after power on, has a flag of State A. When it is inventoried, the flag will go to State B. The tag flag will stay in State B until the tag powers off or the persistence time is up.

A reader can declare it only wants to inventory flag A, so that after a tag is inventoried and its flag gone to State B, it will no longer respond to further inventory rounds – until the end of the persistence time.

Now for S0, S1, S2 and S3, the persistence times are DIFFERENT! Because of that, one has to be very careful in choosing which session to use.

Session	**Tag Flags Persistence Time**
S0	Tag Energized: indefinite Tag Not Energized: none
S1	Tag Energized: 0.5 second < Persistence Time < 5 seconds Tag Not Energized: 0.5 second < Persistence Time < 5 seconds

S2	Tag Energized: indefinite Tag Not Energized: 2 seconds < Persistence Time
S3	Tag Energized: indefinite Tag Not Energized: 2 seconds < Persistence Time

Appendix C: Tag Population and Q

Tag Population is the RFID tag population that is to be inventoried. To be more precise, it is the population of tags that can be "seen" by the RFID reader.

Q is an EPC concept related to the way a group of tags is inventoried. When a reader broadcast its desire to inventory tags, it sends out a Q value. The tag will, based on that Q, calculate a certain number and define that as the number of repeated inventories the reader will do. Basically, the relationship of Inventory Repeats and Q is:

Inventory Repeats = 2^Q

The tag will then choose by random a certain number less than this Inventory Repeats. When the reader starts doing inventory, the tag will then respond at that repeat number.

In other words, the Inventory Repeats should correspond to Tag Population:

Tag Population = Inventory Repeats = 2^Q

For example, if there are 8 tags, then in theory the Q can be 3, and if each tag chooses a number different from that of the other 7 (miraculously, of course), then the 8 tags will be inventoried in an orderly manner in turn.

Of course this will never happen, as the tags will easily choose a number the same as that of another one, and a collision will happen.

Therefore, it is a normal practice to have a bigger Q, such as 4 in this case, so that the 8 tags would have a lower chance of choosing the same number.

Therefore, reversing the equation, ideally, we can have:

$Q = INTEGER(LOG_2(Tag\ Population))$

But in reality, we need some headroom, so that:

$Q = INTEGER(LOG_2(Tag\ Population \times 2)+1$

Appendix D: Query Algorithm

There are 2 types of Query Algorithm: Fixed Q and Dynamic Q.

For Fixed Q, the Q value does not change. In other words, the expected Tag Population does not change.

For Dynamic Q, the Q value changes adaptively: when there are a lot of inventory repeats where no tags respond, the reader will interpret that there are not that many RFID tags in the front, and hence it is more efficient to change the Q to a smaller value. When there are a lot of inventory repeats where the reader receive data but they do not satisfy checksum, meaning there is heavy collision, then the reader will interpret that there are too many RFID tags in the front of the reader, and hence it is better to increase the value of Q. Dynamic Q algorithm is a way to allow the RFID reader to adapt to different amount of RFID tags being seen by the reader. The idea is that if there are not so many tags, then the Q can be reduced and the reader can collect all the tag data faster.

Appendix E: Target

Target here actually refers to the target flag that the reader wants to inventory. There are 2 possible flags of an RFID tag: State A and State B.

When an RFID tag is first powered up, it has a flag of State A. After it is inventoried, the state of the flag becomes State B.

The tag will only go back to State A if either it is powered off and powered on again, or if its persistence time has run up (See Appendix B).

For each round of inventory, the reader sends out notification to the world which tag flag state it wants to inventory. It can keep on inventory State A, or it can inventory State A and State B alternatively from one round of inventory to the next round of inventory.

In theory, it is a good thing to inventory only State A. The reason being that those tags that have been inventoried should not respond again, and will hence quickly reduce the amount of collision between tags. So in general if you set inventory to State A only, the inventory of large amount of tags can be very fast.

The only catch is that when a tag responds to the reader, it does not know another tag is colliding with it. It sends out the response and thinks it has done the job, hence transitioning to flag State B. So in such case, the tag will not respond to further inventory, even though its response has been lost due to collision. Because of that, sometimes the user will set the inventory to target State A in one inventory round, and then State B in the next round, and vice versa, and so on. This is called A/B Toggle or A & B Dual Target or simply Dual Target.

Appendix F: Security

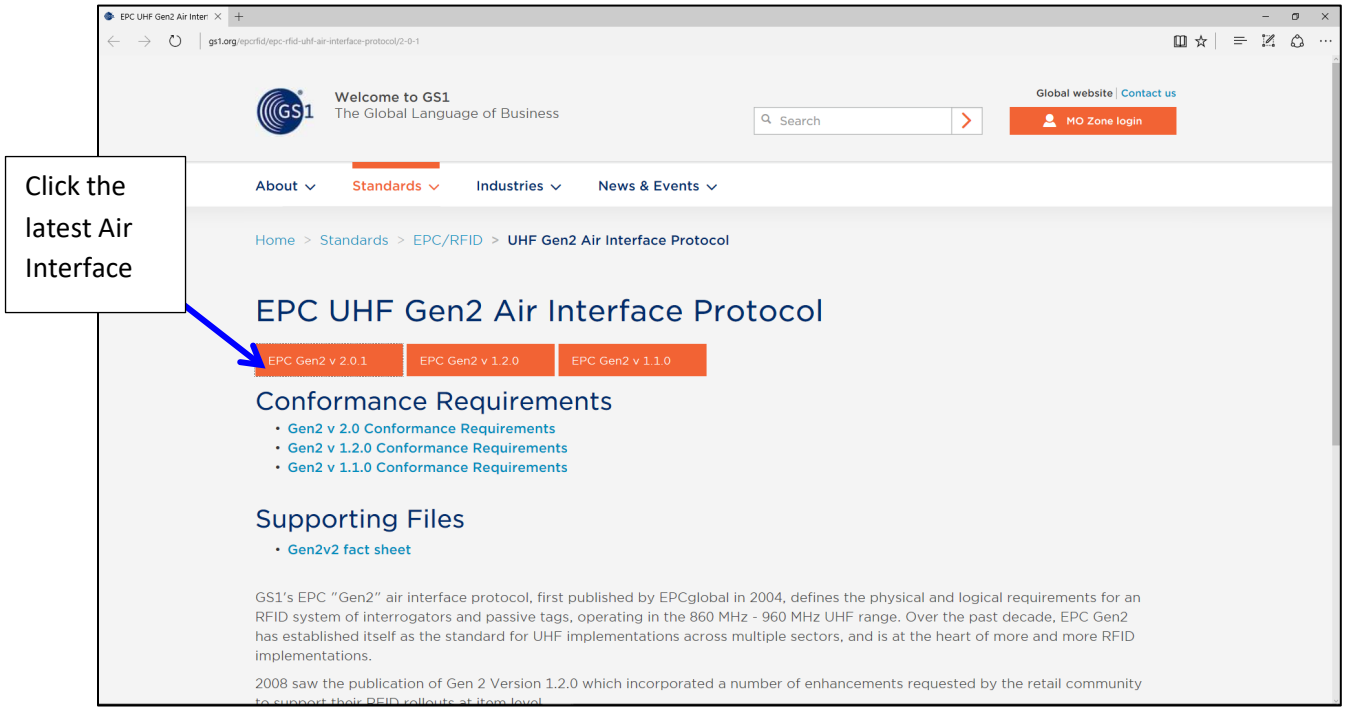
There are 4 actions you can apply on the memory inside an RFID tag:

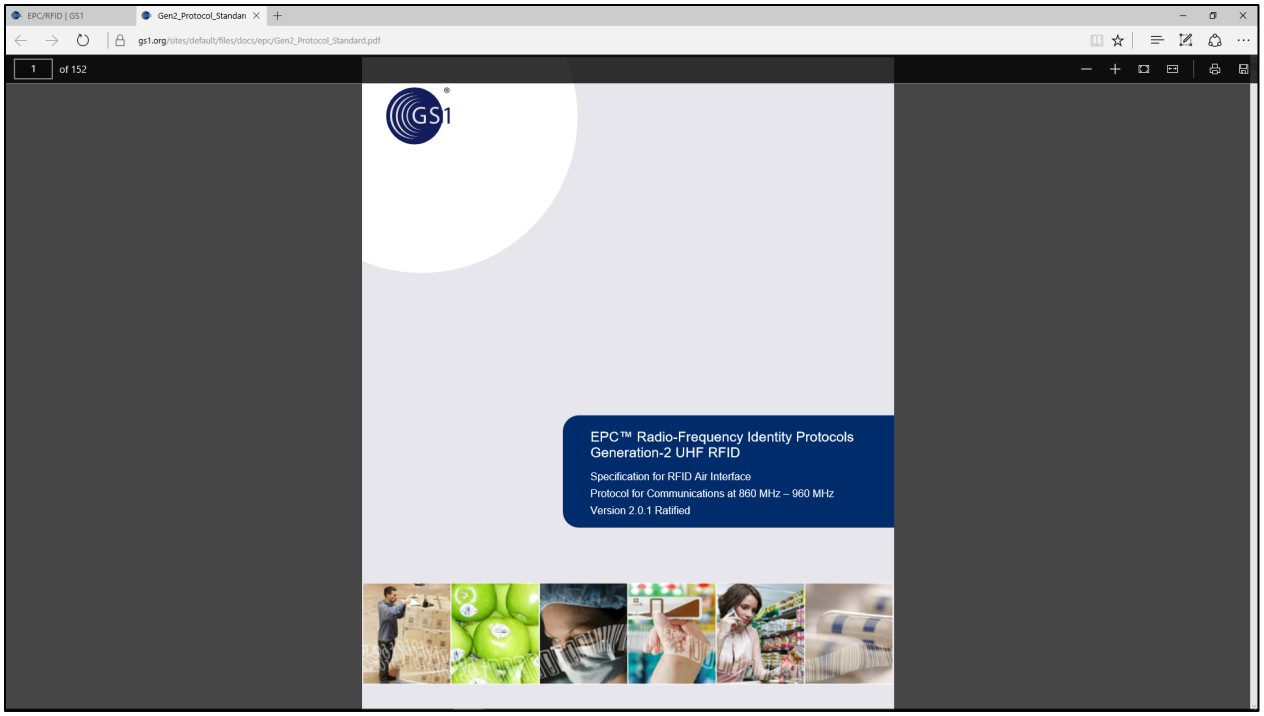
1) Lock
2) Unlock
3) Permanent Lock
4) Permanent Unlock

EPC document which can be found from EPC website:

https://www.gs1.org/epcrfid/epc-rfid-uhf-air-interface-protocol/2-0-1.

Once there, press the button showing the latest air interface and mouse click to get the pdf file.





For Access Password and Kill Password the security locking affects both reading and writing.

For EPC bank and User bank, the security locking affects only writing.

For TID bank, since we are the user and not the manufacturing vendor, security action has no effect. It has been permanently unlocked in the factory anyway.

Appendix G: Models & Regulatory Region

There are various models, denoted by the alphanumeric right after the “CS108-“, here denoted by “**N**”. The applicable regulatory regions for each model are described to the right of it below:

N=1:	865-868 MHz for Europe ETSI, Russia, Mid-East countries,
	865-867 MHz for India
N=2:	902-928 MHz, FCC, for USA, Canada and Mexico. Hopping frequencies locked
N=2 AS:	920-926 MHz, Australia. Hopping frequencies locked
N=2 NZ:	921.5-928 MHz, New Zealand. Hopping frequencies locked
N=2 OFCA:	920-925 MHz, Hong Kong. Hopping frequencies locked
N=2 RW:	920-928 MHz, Rest of the World, e.g. Philippines, Brazil, Peru, Uruguay, etc.
N=4:	922-928 MHz, Taiwan
N=7:	920-925 MHz, China
N=8:	916.7-920.9 MHz, Japan
N=9:	915-921 MHz, Europe Upper Band

Appendix H: Technical Support

All technical support should be sent to the following email:

info@convergence.com.hk