

Android LCM Development Guide

Proculus Technologies Inc.



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1. Interface Introduction

1.1 Serial Port Introduction

Take 7" Android LCM with RK3188 chip for example. It has 3-level serial ports. TtyS0, ttyS1,ttyS2 are normal serial ports. They can be used for serial communication and support baud rate up to 115200. Besides, they support extension by USB-to-serial.



Standard Interface Description of 7" Android LCM

No.	Interface	Description
10	Power Input	12V3A Power Input
11	Sorial Dart O	Device name: ttyS0. Support RS232 and TTL/CMOS. Pin
JT	Senar Port o	definition: GND, RX, TX, VCC.
12	Sorial Port 1	Device name: ttyS1. Support RS232. Pin definition: GND, RX,
JZ	Senarport	TX, VCC.
12	Sorial Port 2	Device name: ttyS3. Support RS232. Pin definition: GND, RX,
13	Sellarolts	TX, VCC (Not available for RK3128).
и	LISP to Sorial Port	Device name: ttyCOM0. Support RS232. Pin definition: GND,
14		RX, TX, VCC.
J5	Loudspeaker Port	4W Loudspeaker Output
J6	RJ45 Network Port	Support 10M/100M Network
J7	Wireless Port	Support IEEE802.11b/g/n. Wireless & Bluetooth 2in1 available.
18	TF Card	
19	USB 2	Support USB peripheral devices.
J10	USB DEBUG	USB port for App debugging and firmware upgrading.
J11	USB1	Support USB peripheral devices.
J12	MIC Port	Audio input port



J13	Serial Port for	Reserved for Debugging	
	Debugging		
J14	RECOVERY	Short-circuit to enter firmware burning mode	
J15	Buzzer		
J16	RTC Port	Provide system RTC	
J17	Sleep Wake-up Port		
J18	Power Input	Same as JO	

1.2 USB Port Introduction

Also take the example of 7" Android LCM with RK3188 chip. It has both USB HOST and USB DEVICE. USB HOST supports USB mouse, USB flash drive, etc. USB DEVICE is used for android applications development by android engineers.

2. Software Development

2.1 Java Environment Construction and Configuration

2.1.1 Tools needed to install java on Windows:

JDK: JDK is short for Java Development Kit. It includes java running environment, tools set, basic libraries, etc.

Android JDK: Android JDK is Android Java Development Kit provided by Google. During the development, it needs to be drawn in to use relevant API.

Android Studio: Google official IDE tool produced in 2003. As android studio no longer exists as a widget, it is much more convenient and stronger than Eclipse.

2.1.2 Download JDK

Click Download button as below:

http://www.oracle.com/technetwork/java/javase/downloads/index.html

ORACLE Menu Q L Sign In 🗸 🏈 Country/Region Call Java SDKs and Tools Java SE Overview Downloads Documentation Community Technologies Training Java EE Java SE Downloads Java EE and Glassfish Java ME 🛓 Java ME Java SE Subscription Java Card Java Embedded NetBeans IDE Java Card lava Java Mission Control Java TV Java Resources Community Java Magazine Java APIs Technical Articles Java Platform, Stand E Demos and Videos Java SE 10.0.2 Java SE 10.0.2 is the latest feature release for the Java SE Platform Forums E Java Magazine E Developer Training Installation Instructions E Tutorials Release Notes E Java.com Oracle License Java SE Licensing Information Use
 Includes Third Party Licenses Certified System Config Readme

You need to accept license agreement and choose the version that fits your OS. Take Windows(x64) for example.

Java S You must accept the Oracle Bi	SE Develo	pment Kit 10.0.2 ense Agreement for Java SE to download this ware.
Accept Lice	ense Agreemer	nt 💿 Decline License Agreement
Product / File Description	File Size	Download
Linux	306 MB	idk-10.0.2_linux-x64_bin.rpm
Linux	338.43 MB	idk-10.0.2_linux-x64_bin.tar.gz
macOS	395.46 MB	idk-10.0.2_osx-x64_bin.dmg
Solaris SPARC	207.07 MB	➡idk-10.0.2 solaris-sparcv9 bin tar.oz
Windows	390.25 MB	idk-10.0.2 windows-x64 bin.exe

Install JDK after downloading. JRE can be installed together with JDK. Installation information can be customized such as the install path and etc..



2.1.3 Deploy Environment Variables

1. After installation of JDK, right click on "My Computer", Click "Properties" and choose.



2. Click "Advanced" tab and click on "Environment Variables"

computer Name	Hardware	Advanced	System Protection	Remote	
You must be lo	gged on as a	an Administra	tor to make most of t	hese change	s
Performance					100
Vieual effecte	DIDCORPOT P	chedulina m	emony usage and vir	tual memory	
viaudi cirecta	, processor a	cricdding, m	entory dadge, and vir	tual memory	
				Settings	1
User Profiles					
Desktop settin	ngs related to	your logon			
			_		
				Settings	
Startup and R	ecoverv				
System startu	n system fail	ure and deb	ugging information		
				Settings	1
			_		_
			Environme	nt Variables	
				TIL Valiabics.	

3. Configure 3 values in "System variables": "JAVA_HOME", "PATH" and "CLASSPATH". Click "Edit" if they exist. Otherwise click "New".

Value	
%USERPROFILE%\AppData\Local\Tem	D
%USERPROFILE % Applata (Local (Teni)	
New Edit De	lete
s Value	4
C:\Windows\system32\cmd.exe	
_C NO	
P 4	
Windows_NT	
	Value %USERPROFILE%\AppData\Local\Temp %Userprofile %Userprofile <



Parameters of Variables configuration as below:

Variable Name	Value			
JAVA_HOME	C:\Program Files (x86)\Java\jdk1.8.0_91 //Configure to your own path			
PATH	%JAVA_HOME%\bin;%JAVA_HOME%\jre\bin;			
CLASSPATH	.;%JAVA_HOME%\lib\dt.jar;%JAVA_HOME%\lib\tools.jar; //			

Note: PATH needs to be re-configured as %JAVA_HOME%\bin;, otherwise operations such as command lines and Eclipse will fail.

After all above java environment configuration, you can run Eclipse to write codes. Eclipse will finish the configuration automatically.

2.1.4 Test if JDK is successfully installed

- 1. "Start" -> "Run" -> Input "cmd";
- 2. Input commands: "java-version", "java" and "javac". Environment variable configuration is successful if below information shows:

```
C:\Users\prado>java -version
java version "1.8.0_91"
Java(TM) SE Runtime Environment (build 1.8.0_91-b14)
Java HotSpot(TM) 64-Bit Server VM (build 25.91-b14, mixed mode)
```

2.2 Installation of Android Studio and Environment Building

2.2.1 Download and Install Android Studio

Open link: <u>http://www.android-studio.org/</u> and click Download Android Studio.

	An Constant Andread 公用所有的所有工具。 Andread The International Constant Constant Constant Constant Constant 文文石田殿: 0.77888	1.18, 2016	
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	medireidfretwillerieder145, 3000200Freiselbere, ene 元 Andreid IDE	423 MB (444308280 bytes)	54x65x5x5x343x67x5404xxx720654x8x1£304115
	metrochurtatianider145.500004/vendeen.nip 天 Andreid 106, 天安集程序	445 MD (467095338 bytes)	27152011c2500c0120926db452eadSefa955
361 05 1	andreichterfahlter Liber 147, 5500004 mach dag	440 MB (401824413 hytes)	2+097+02001+05-009112x29+172c5285+363449
		ALC: NO	Terrary Construction and the second sec



1. Open the installation package and start installation process:



2. Select "Android Virtual Device" :

e contra	hoose Components Choose which features of Androi	d Studio you want to install.
Check the components you w install. Click Next to continue.	ant to install and uncheck the con	nponents you don't want to
Select components to install:	Android Studio Android SDK Android Virtual Device	Description Position your mouse over a component to see its description.
Space required: 4.3GB		
	Rade	Neut



3. Choose "Android Studio Installation Location" and "Android SDK Installation Location" and continue:

	Configuration Settings	
< l	Install Locations	
undroid Stud	dio Installation Location	
The locati Click Brow	on specified must have at least 500MB of free space. use to customize:	
C: Progra	am Files\Android\Android Studio	Browse
Cultinered	Doubledk1	The state of the second s
C: Users	David (AppData (Local (Android (sdk 1	Diomacrit
C:\Users	David (AppData (Local (Android (sdk 1	Vext > Cance

4. Finish the installation:

	Completing Android Studio Setup
R	Android Studio has been installed on your computer. Click Finish to close Setup.
	Start Android Studio
Andraid	
Studio	
	< Back Finish Cancel



5. Make sure your computer can get access to Google and download necessary files:

l'Androi d'is did
Presipiis Next Cancel

6. Click "Finish"

_	
	Android SDE was installed to C. Users/David/AppDate/Local/Android/addi
	Installing Archives
	Preparing to install archives
	Installing Android SDK Build-tools, revision 23.0.2
	Installed Android SDE Build-teals, revision 23.0.2
	Installing Google Repository, revision 23
	Installed Google Repository, revision 23
	Installing Google APIs Intel add Atom System Image, Google Inc. API 23, revision B
	Installed Google AFIs Intal a86 Atom System Image, Google Inc. AFI 23, revision 8
	Installing Android SDE Tools, revision 24.4.1
	Installed Android SDR Tools, revision 24.4.1
	Done. 4 packages installed.
	Android SDK is up to data
	Creating Android virtual device
	이 것 같은 것 같

C



8.

7. If you still need to install other version of SDK, open Android Studio and Click "Configure":

Recent Proje	ets	Quick Start	
dRudioProjectn,A	Start a n	ew Android Studio project	
	Open an	existing Android Studio project	
	VCS check or	d project from Version Control	
	Import p	roject (Eclipse ADT, Gradle, etc.)	
	Import a	n Android code sample	
	🔏 Configur		4
	Docs are	How-Tos	-
K Manager	aroid Studi	0	
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9. Click "Launch Standalone SDK Manager" in "Default Settings":

	oppaarance & Behavior - System Se	ttings - Android SDK		
Appearance & Behavior	Anager for the Android SDK and Tor	ols used by Android Studio		
Appearance J	edroid SDK Location (C/(Deers)/Dev	id/AppData(Local/Android)p	dk3	548
Menus and Toolbars	SDK Platforms SDK Tools SDK Up	date lites		
Passeords HTTP Proxy	Each Android SDK Platform package level by default. Once installed, Andr package details' to display individua	includes the Android platfor old Studio will automatically o I SDK components.	n and sources pertaining heck for updates. Check '	to an APT Whow
Linear Statistics	Netw	APE Level	Revision	Distur
Unage statestics	Android 6.0	23	1	Update available
And but here	Android 511	1410	- 10 B.	Not installed
NORSCHERE	Android 5.0.1	71	2	Peot installed
Quark Lists	Android 4.4W.J	12	-	Part Installed
Кеутар	D Android 4.11	17	-	Nut installed
Editor	Android 4.7.2	17	1	Red Installed
Plugins	Android 41.2	16	5	Not installed
fulld Execution Deployment	Android 4.0.1	15	5	Not installed
Tests	Android 2.3.3	10	2	Not installed
1 pora	Android 2.2		3	Not installed
	1			Show Package Deta
	aurch Dandalore SDK Manager		OK	Carcel Aurily Hel

10. Choose the version you need and download:

ackages Tools				
DK Path: C:\Users\David\AppData\Local\Android\sc	iki.			
ackages				
🐳 Name	API	Rev.	Status	
🔄 🗍 Sources for Android SDK	15	2	Not installed	
🛅 🔁 Android 2.3.3 (API 10)				
👿 📫 SDK Platform	10	2	Not installed	
📃 👗 Samples for SDK	10	1	🗍 Not installed	
🛅 🏢 Intel x86 Atom System Image	10	3	Not installed	
🖂 🙀 Google APIs	10	2	Not installed	
🗐 🔁 Android 2.2 (API 8)				
📝 📫 SDK Platform	8	3	Not installed	
Samples for SDK	8	1	Not installed	
📄 🧛 Google APIs	8	2	🗍 Not installed	=
🛅 🤐 Extras				
🛅 👩 Android Support Repository		25	🛱 Installed	
how: 🗹 Updates/New 📝 Installed Select New or	Updates		Install 2 pag	kages
Obsolete Deselect All			Delete pac	kages



2.2.2 Configure NDK Development Environment in Android Studio

It is more complicated to realize NDK development in Android Studio than in Eclipse as there is no way to add native support with one button in Android Studio. Below shows how to realize such functions in Android Studio.

Step 1: Install NDK

Open "Tools" -> "Android" -> "SDK Manager" -> "SDK Tools", select LLDB and NDK, click OK to start the installation.



Step 2: Import So Library to "libs"

So Library Download link: http://www.proculustech.com/SoftwareResources/libs.rar



Step 3: Synchronize resource library



2.3 Serial Port Development & Demo Briefing

Serial Port Demo Download Link: http://www.proculustech.com/SoftwareResources/Serial%20Port%20Demo.rar

2.3.1 Serial Communications

It is unavoidable to discuss serial port development without serial communications.

The concept of Serial Communications is quite simple. It is one kind of communications that happens between peripheral and PC via signal wire, earth wire or control wire. The serial port sends and receives bytes by bit. Although it is slower than communicate by byte, serial port can send data with one wire while receive data with another. It is simple and can realize long-distance communications.

The most important parameters of serial communications are baud rate, data bit, stop bit and parity check. For the terminals to communicate, these parameters must match.

2.3.2 Serial Communication between Android LCM and Android Applications

Below are the steps to realize the communication:

- 1. Serial port initialization: Create serial port and set serial parameters (defined path and baud rate);
- 2. Access input stream: Read serial data;
- 3. Access output stream: Send data to serial port;
- 4. Data processing and display;
- 5. Close serial port.

2.3.3 Instructions of codes in serial demo

Step 1: Import "So" Library

1. Copy "so" library to folder "jinLibs"





2. Add configuration in "android" tag in "build.gradle"

```
sourceSets {
main {
jni.srcDirs = []
jniLibs.srcDirs = ['src/main/jniLibs', 'libs']
}
```

Step 2: Copy all the files under "android_sericalport_api" to folder "java". (Do not change the

path)



Step 3: Use the serial port

1 Initialize SerialPortManager

SerialPortManager.getInstances().initSerialPort();

2 Open Serial Port

// Access the example of serial tool object(The example is used to open/close serial port and send data).
SerialPortserialPort = SerialPortManager.getInstances().getSerialPort();

// Initialize read listener

```
ReadListenerreadListener= new ReadListener() {
@Override
public void onRead(final String port, final booleanisAscii, final String read) {
Log.d("SerialPortRead", new StringBuffer()
.append("serial port number: ").append(port)
.append("\n data format:").append(isAscii ? "ascii" :"hexString")
.append("\n read:").append(read).toString());
};
```

// Open serial port with serial tool object example to transfer to read listener.



serialPort.startSerialPort(SerialPortManager.ttyCOMO, false, readListener);// open serial port /dev/ttyCOMO. Data format is HexString.

3 Modify read data format

serialPort.setReadCode(SerialPortManager.ttyCOM0, true);// Modify serial port /dev/ttyCOM0 Read data format is Ascii

4 Send data (Serial port should be open)

serialPort.writeSerialService(SerialPortManager.ttyCOM0, false, "data to be sent");// write data to /dev/ttyCOM0. Data format is HexString. Data content: "data to be sent"

5 Close serial port

serialPort.stopSerialPort(SerialPortManager.ttyCOM0);// Close serial port /dev/ttyCOM0

6 Log block (configure log block to read the log)

// Configure the log block SerialPortManager.getInstances().setLogInterceptor(new LogInterceptorSerialPort() { @Override public void log(@SerialPortManager.Typefinal String type, final String port, final booleanisAscii, final String log) { Log.d("SerialPortLog", new StringBuffer() .append("Serial port number:").append(port) .append("\n data format:").append(isAscii ? "ascii" : "hexString") .append("\n operation type:").append(type) .append("operation report:").append(log).toString()); } };

7 Destroy SerialPortManager. It requires re-initialize when using serial port after destroying. SerialPortManager.getInstances().destroySerialPort();

2.3.4 Serial Demo Code

packagecom.hyperlcd.serialport; importandroid.os.Bundle; importandroid.support.annotation.IdRes; import android.support.v7.app.AppCompatActivity; importandroid.text.TextUtils; importandroid.util.Log; importandroid.view.Gravity; importandroid.view.View; importandroid.widget.CompoundButton; importandroid.widget.EditText; importandroid.widget.RadioButton; importandroid.widget.RadioGroup;

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importandroid.widget.TextView; importandroid.widget.Toast;

importandroid_serialport_api.hyperlcd.LogInterceptorSerialPort; importandroid_serialport_api.hyperlcd.ReadListener; importandroid_serialport_api.hyperlcd.SerialPort; importandroid_serialport_api.hyperlcd.SerialPortManager;

public class MainActivity extends AppCompatActivity implements View.OnClickListener {

privateRadioGroupcodeRG; privateRadioGroupserialRG; privateEditTextserialET; privateEditTextsendET; privateTextViewreadTV; privateTextViewlogTV; privateTextViewserialTitle; privateTextViewcodeTitle;

private String currentPort; privateSerialPortserialPort; privateReadListenerreadListener; privatebooleanisAscii;

@Override

protected void onCreate(Bundle savedInstanceState) { super.onCreate(savedInstanceState); setContentView(R.layout.activity_main);

initView();

initData();

}

private void initData() {

SerialPortManager.getInstances().initSerialPort();

SerialPortManager.getInstances().setLogInterceptor(new LogInterceptorSerialPort() {

@Override

public void log(@SerialPortManager.Type final String type, final String port, final booleanisAscii, final String log) {

Log.d("SerialPortLog", new StringBuffer() .append("serial port number: ").append(port)

.append("\n data format:").append(isAscii ? "ascii" : "hexString")

.append("\n operation type:").append(type)

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```
.append("operation report: ").append(log).toString());
runOnUiThread(new Runnable() {
@Override
public void run() {
logTV.append(new StringBuffer()
     .append(" ").append(port)
     .append(" ").append(isAscii ? "ascii" : "hexString")
.append(" ").append(type)
.append(": ").append(log)
.append("\n").toString());
        }
      });
   }
});
serialPort = SerialPortManager.getInstances().getSerialPort();
readListener = new ReadListener() {
@Override
public void onRead(final String port, final booleanisAscii, final String read) {
Log.d("SerialPortRead", new StringBuffer()
.append(port).append("/").append(isAscii ? "ascii" : "hex")
.append(" read: ").append(read).append("\n").toString());
runOnUiThread(new Runnable() {
@Override
public void run() {
readTV.append(new StringBuffer()
.append(port).append("/").append(isAscii ? "ascii" : "hex")
.append(" read: ").append(read).append("\n").toString());
       }
    });
   }
  };
 }
private void initView() {
codeRG = (RadioGroup) findViewById(R.id.rg_code);
serialRG = (RadioGroup) findViewById(R.id.rg_serial);
serialET = (EditText) findViewById(R.id.et_serial);
sendET = (EditText) findViewById(R.id.et_send);
serialTitle = (TextView) findViewById(R.id.title_serial);
codeTitle = (TextView) findViewById(R.id.title_code);
```



```
readTV = (TextView) findViewById(R.id.tv_read);
logTV = (TextView) findViewById(R.id.tv_log);
codeRG.setOnCheckedChangeListener(new RadioGroup.OnCheckedChangeListener() {
   @Override
public void onCheckedChanged(RadioGroup group, @IdResintcheckedId) {
changeCode(checkedId == R.id.rb_ascii);
             }
         });
serialRG.setOnCheckedChangeListener(new RadioGroup.OnCheckedChangeListener() {
              @Override
public void onCheckedChanged(RadioGroup group, @IdResintcheckedId) {
if (checkedId == R.id.rb_other) {
serialET.requestFocus();
                  } else {
sendET.requestFocus();
                  }
             }
         });
serialET.setOnFocusChangeListener(new View.OnFocusChangeListener() {
              @Override
public void onFocusChange(View v, booleanhasFocus) {
if (hasFocus) {
serialRG.check(R.id.rb_other);
                  }
             }
         });
findViewById(R.id.btn_open).setOnClickListener(this);
findViewById(R.id.btn_close).setOnClickListener(this);
findViewById(R.id.clear_send).setOnClickListener(this);
findViewById(R.id.btn_send).setOnClickListener(this);
findViewById(R.id.clear_read).setOnClickListener(this);
findViewById(R.id.clear_log).setOnClickListener(this);
codeRG.check(R.id.rb_ascii);
serialRG.check(R.id.rb_com0);
sendET.requestFocus();
    }
```

@Override
protected void onDestroy() {



SerialPortManager.getInstances().destroySerialPort();

super.onDestroy(); } @Override public void onClick(View v) { switch (v.getId()) { caseR.id.btn_open: open(); break; caseR.id.btn_close: close(); break; caseR.id.btn_send: send(); break; caseR.id.clear_send: sendET.setText(""); break; caseR.id.clear_read: readTV.setText(""); break; caseR.id.clear_log: logTV.setText(""); break; default: } } private void send() { if (serialPort == null) { // Serial Port Uninitialized T("Serial Port Uninitialized"); return; } if (TextUtils.isEmpty(currentPort)) { // Serial Port Not Open T("Serial Port Not Open"); return; } String send = sendET.getText().toString().trim(); if (TextUtils.isEmpty(send)) {



```
//Data Empty
              T("Data Empty");
return;
         }
         // Send Data
try {
serialPort.writeSerialService(currentPort, isAscii, send);
         } catch (Exception e) {
e.printStackTrace();
         }
     }
     /**
      * Open Serial Port
      */
private void open() {
if (serialPort == null) {
return;
         }
         String checkPort = getCurrentPort();
if (TextUtils.isEmpty(checkPort)) {
return;
         } else if (TextUtils.equals(checkPort, SerialPortManager.other)) {
checkPort = serialET.getText().toString().trim();
if (TextUtils.isEmpty(checkPort)) {
                   T("Enter Serial Port Num.");
return;
              }
         }
if (TextUtils.equals(currentPort, checkPort)) {
return;
         }
if (!TextUtils.isEmpty(currentPort)) {
              // Close currentPort
serialPort.stopSerialPort(currentPort);
         }
isAscii = codeRG.getCheckedRadioButtonId() == R.id.rb_ascii;
currentPort = checkPort;
          // Open checkPort
serialPort.startSerialPort(checkPort, isAscii, readListener);
```

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```
serialTitle.setText("Serial Port:");
serialTitle.append(currentPort);
codeTitle.setText("Data Format:");
codeTitle.append(isAscii ? "ASCII" : "HexString");
    }
     /**
      * Close Serial Port
      */
private void close() {
if (!TextUtils.isEmpty(currentPort)) {
              // Close currentPort
serialPort.stopSerialPort(currentPort);
currentPort = "";
serialTitle.setText("Serial Port");
codeTitle.setText("Data Format");
         }
    }
     /**
      * Modify Data Format
      *
      * @paramisAsciitrue:asciifalse:HexString
      */
private void changeCode(booleanisAscii) {
if (TextUtils.isEmpty(currentPort)) {
return;
         }
serialPort.setReadCode(currentPort, isAscii);
codeTitle.setText("Data Format:");
codeTitle.append(isAscii ? "ASCII" : "HexString");
    }
     /**
      * Access chosen serial port
      *
      * @return
      */
private String getCurrentPort() {
         String checkPort;
switch (serialRG.getCheckedRadioButtonId()) {
case R.id.rb_com0:
checkPort = SerialPortManager.ttyCOM0;
break;
```



```
case R.id.rb_com1:
checkPort = SerialPortManager.ttyCOM1;
break;
case R.id.rb_com2:
checkPort = SerialPortManager.ttyCOM2;
break;
case R.id.rb_com3:
checkPort = SerialPortManager.ttyCOM3;
break;
case R.id.rb_s0:
checkPort = SerialPortManager.ttyS0;
break;
case R.id.rb_s1:
checkPort = SerialPortManager.ttyS1;
break;
case R.id.rb_s2:
checkPort = SerialPortManager.ttyS2;
break;
case R.id.rb_s3:
checkPort = SerialPortManager.ttyS3;
break;
caseR.id.rb_other:
checkPort = SerialPortManager.other;
break;
default:
checkPort = "";
         }
returncheckPort;
    }
private Toast toast;
privateTextViewtextView;
private void T(String message) {
if (toast == null) {
toast = Toast.makeText(this, "", Toast.LENGTH_SHORT);
textView = new TextView(this);
textView.setTextColor(0xffffffff);
textView.setTextSize(30);
textView.setPadding(10, 5, 10, 5);
textView.setBackgroundResource(R.drawable.shape_toast_bg);
toast.setView(textView);
toast.setGravity(Gravity.CENTER, 0, 0);
         }
```



```
textView.setText(message);
toast.show();
}
}
```

2.4 Introduction of Self-starting

There are two methods of realizing self-starting. One is to self-start when receiving booting broadcasting. It starts APK after entering system desk. The other is to set its own APK as Launcher. It will skip system desk and start APK directly.

2.4.1 Self-start after receiving booting broadcasting

When Android start-up, it will send out a system broadcast "ACTION_BOOT_COMPLETED". Usually, its string constant is "android.intent.action.BOOT_COMPLETED". The program just needs to capture this message and self-start. So the way of realizing this function is to make a BroadcastReceiver.

The most important part of self-starting is to give the application the authority of "launcher".

Step 1: Customize Broadcast Class "BootReceiver"

```
public class BootReceiver extends BroadcastReceiver {
```

@Override

public void onReceive(Context context, Intent intent) {

if(intent.getAction().equals("android.intent.action.BOOT_COMPLETED")) { // boot

Intent intent2 = new Intent(context, MainActivity.class);

- // intent2.setAction("android.intent.action.MAIN");
- // intent2.addCategory("android.intent.category.LAUNCHER"); intent2.setFlags(Intent.FLAG_ACTIVITY_NEW_TASK);

context.startActivity(intent2);

Step 2: Manifest Files Configuration

Add customized broadcast class in "Application" of "AndroidManifest.xml":

<receiver android:name="BootReceiver" >

<intent-filter>

<action android:name="android.intent.action.BOOT_COMPLETED" />

<category android:name="android.intent.category.LAUNCHER" />

</intent-filter>

</receiver>

}

Step 3: Add auto-start authority in "Manifest" of "AndroidManifest.xml"

<uses-permission android:name="android.permission.RECEIVE_BOOT_COMPLETED" />



2.4.2 Set its own APK as Launcher

Replace <intent-file> of the first activity in configuration file.

```
<activity
android:name="com.imstlife.mydoor.MainActivity"
android:configChanges="screenSize"
android:label="@string/app_name"
android:launchMode="singleTop">
<intent-filter>
<action android:name="android.intent.action.MAIN" />
```

<category android:name="android.intent.category.LAUNCHER" /> <category android:name="android.intent.category.HOME" /> <category android:name="android.intent.category.DEFAULT" /> <category android:name="android.intent.category.MONKEY" />

</intent-filter>

</activity>

Start program and click "Home". Select the APK in popup select box, choose "Always" and confirm.

2.5 Change System Signature

Step 1:

Add android:sharedUserId="android.uid.system" in configuration file "Manifest" of "AndroidManifest.xml". Compile source code with Eclipse to generate APK file (Please refer to the code in the demo)

Step 2:

Change the apk file's format into *.zip. Open it and delete "CERT.SF" and "CERT.RSA" in "META-INF".

Step 3:

Change the file back into *.apk. Put the file under the path F:/androidsource (Can be modified). Make sure "platform.pk8", "platform.x509.pem", "signapk.jar" are in the same folder. **Step 4:**

Run "cmd.exe" and input "cd androidsource" and run command: java -jar signapk.jar platform.x509.pem platform.pk8 SetSystemTime.apk test.apk. As below image:





2.6 APK Encryption

2.6.1 Obfuscated Code

1. Global obfuscation options. Modify build/core/package.mk

ifndef LOCAL_PROGUARD_ENABLED

- ifneq (\$(filter user userdebug, \$(TARGET_BUILD_VARIANT)),)
 - # turn on Proguard by default for user & userdebug build
 - LOCAL_PROGUARD_ENABLED :=full

Endif

- Global flag files modification. Shield –dontobfuscate and modify build/core/proguard.flags
 # Don't obfuscate. We only need dead code striping.
 #-dontobfuscate
- 3. Create proguard.cfg under its own module to configure obfuscation options.
- 4. Add below commands under LOCAL_MODULE -> LOCAL_PACKAGE_NAME in Android.mk LOCAL_PROGUARD_ENABLED := full #Designate current application to open obfuscation LOCAL_PROGUARD_FLAG_FILES := proguard.cfg #Designate obfuscation configuration file
- 5. User /setenv.sh -bv user to set environment variable when compiling
- 6. Modify proguard.cfg when reporting error.

2.6.2 Avoid Repeated Packing

- 1. Add signature verification in Java code (modify smali file directly)
- 2. Add signature verification in NDK (check with IDA and modify in HEX)
- 3. Take advantage of its own defect to prevent packing (Manifest cheat, change suffix of image file, etc.)

2.6.3 Use Third-party Tools to Encrypt DEX, RES and SO Library

Step 1: Export APK

Step 2: Reinforce with third-party platform (generate multi-channel package) **Step 3:** Re-sign APK

There is no signature in the reinforced APK. And it cannot be installed to LCM without a signature. Using built-in signature tool to resign APK is very complicated. Therefore we suggest using third-party signature tool.

2.7 Usage of Buzzer (Only available for certain series of LCMs)

2.7.1 Principle

Buzzer is integrated electronic equipment used for sounding device in electronic products.

2.7.2 Procedure

Buzzer is controlled by MCU. MCU and Main chip communicate with serial port and Android application open serial port to send [BEEP] to realize buzzer.



2.7.3 Android Code

Step 1: Create Class RootShellCmd

```
public class RootShellCmd {
     private OutputStream os;
     /**
      * Execute shell command
      * @param cmd
      */
     public final void exec(String cmd) {
           try {
                 if (os == null) {
                      os = Runtime.getRuntime().exec("su").getOutputStream();
                 }
                 os.write(cmd.getBytes());
                 os.flush();
           } catch (Exception e) {
                 e.printStackTrace();
           }
     }
     /**
      * Open buzzer
      */
     public void openBuzzer() {
           exec("echo 168 > /sys/class/gpio/export\n");
           exec("echo"+" out"+" > /sys/class/gpio/gpio168/direction\n");
           exec("echo out > /sys/class/gpio/gpio168/direction\n");
           exec("echo 1 > /sys/class/gpio/gpio168/value\n");
     }
     /**
       * Close buzzer
      */
     public void closeBuzzer() {
           exec("echo 0 > /sys/class/gpio/gpio168/value\n");
```

Step 2: Call the method of controlling buzzer in MainActivity

RootShellCmd rootShellCmd = new RootShellCmd(); rootShellCmd.openBuzzer();// rootShellCmd.closeBuzzer();//

}



2.8 Show & Hide Navigation Bar

Create Class "RootShellCmd.Android" in Android application to send adb command to LCM to realize the function.

Step 1: Create Class "RootShellCmd"

```
public class RootShellCmd {
     private OutputStream os;
     /**
      * Execute shell command
      * @param cmd
      */
     public final void exec(String cmd) {
           try {
                 if (os == null) {
                      os = Runtime.getRuntime().exec("su").getOutputStream();
                 }
                 os.write(cmd.getBytes());
                 os.flush();
           } catch (Exception e) {
                 e.printStackTrace();
           }
     }
     /**
      * Backstage simulation global key
      * @param keyCode
      */
     public final void simulateKey(int keyCode) {
           exec("input keyevent " + keyCode + "\n");
     }
     /**
      * Hide Navigation Bar
     public static void closeBar() {
       try {
                // REQUIRES ROOT
                 Build.VERSION CODES vc = new Build.VERSION CODES();
                 Build.VERSION vr = new Build.VERSION();
                 String ProcID = "79"; // HONEYCOMB AND OLDER
                 // v.RELEASE //4.0.3
                 if (vr.<u>SDK INT</u> >= vc.<u>ICE CREAM SANDWICH</u>) {
                      ProcID = "42"; // ICS AND NEWER
                 Process proc = Runtime.getRuntime().exec(
```



```
new String[] {"su","-c","service call activity " +
     ProcID+ " s16 com.android.systemui" }); // WAS 79
                 proc.waitFor();
           } catch (Exception ex) {
                 ex.printStackTrace();
           }
     }
     /**
       * Show Navigation Bar
       */
     public static void showBar(){
           try {
                 // REQUIRES ROOT
                 Build.VERSION_CODES vc = new Build.VERSION_CODES();
                 Build.VERSION vr = new Build.VERSION();
                 String ProcID = "79"; // HONEYCOMB AND OLDER
                 // v.RELEASE //4.0.3
                 if (vr.<u>SDK_INT</u> >= vc.<u>ICE_CREAM_SANDWICH</u>) {
                      ProcID = "42"; // ICS AND NEWER
                 }
                 //Execute command
                 Process proc = Runtime.getRuntime().exec()
                            new String[] {"su","-c","am startservice -n
     com.android.systemui/.SystemUIService " }); // WAS 79
                 proc.waitFor();
           } catch (Exception ex) {
                 ex.printStackTrace()
      }
Step 2: Hide/Show Navigation Bar in MainActivity
```

RootShellCmd.closeBar();//Hide Navigation Bar //RootShellCmd.showBar();//Show Navigation Bar

}



2.9 Change Boot Animation & Boot Image

Download firmware factory tool

Link: http://www.proculustech.com/SoftwareResources/Firmware%20Factory%20Tool.zip

2.9.1 Image Configuration

"Firmware Factory Tool" can be used to check & replace kernel picture, Android boot animation, default wallpaper & charging animation.

Elemente I				
Firmware			Prompt	
SYSTEM SETTING				
System info		Logo config		
Company	Model number	Replace boot logo Replace boot	anim Replace wallpaper Repalce charge anim	
		Boot logo Boot animation Defau	lt wallpaper	
Build number				
SDK version				
JSB info				
107D C				
USB factory				
Disk volume				
System config				
NPT setting	Rinstaath Davias			
place boot rit	OPER			
		APK config(Use right button to a	dd or del)	
		System apk Preinstall apk		
oys status clone				
V	Address in Andres into Gimmonts 121-	File name	File size – File date	
system settings, bro	wser settings, preinstall apks etc.			
-				
	SYSTEM_CLONE			

2.9.2 Modify Boot Logo

2.9.2.1 Generation of Kernel Logo

Use "FirmwareToPPM.exe" in the folder "Firmware Factory Tool\bin" to transform 224ppm picture (support *.ppm, *.bmp, *.jpg, *.png). Put the transformed picture into kernel to compile.





2.9.2.2 Modify Boot Logo

Open "Firmware Factory Tool" and click "Replace boot logo". Choose the boot logo that needs to be changed. The tool will filter compatible pictures according to the logo file in your firmware (support *.ppm, *.bmp, *.jpg, *.png).



Note: The firmware with bmp logo file configuration supports multi-resolution. The maximum resolution and displayed logo resolution are shown below:

2.9.3 Modify Boot Animation

2.9.3.1 Create Boot Animation

The file of boot animation is bootanimation.zip. It contains two parts: Part0 and desc.txt.

- 1. Part0: Pictures of boot animation is stored in this folder. The resolution of the picture must be the same as the resolution of the device.
- 2. Desc.tex: This file is generated in Linux. The parameters are shown below (give an example with resolution 800*480):



File	Edit	Format	View	Help
800	480	10		
p (0 (part()	

Descriptions of parameters in file "desc"

Parameter	Description
800 480 10	800 480 – Screen Resolution
	10 No. of pictures played per second
P 0 0 part0	P – Play
	0 – 0: Loop Play; 1: Single Play
	0 – Delay time
	Part0 – Folder to store animation files

After replacing the animation files in part0 folder, compress file as below (must be compressed as *.zip file):

	Advanced	Options	Files	Backup	Time	Comment	
Archiv	e name						Browse
boota	animation.zip	8					
Defau	lt Profile			Update n	node		
	Profile	s		Add and	replace	files	
20mpi Store Dictior 32 KE	ession metho nary size	od	•	Cre Add <u>T</u> es	ate <u>s</u> olic l r <u>e</u> cove t archiv e k archive	l archive ry record ed files e	
	o <u>v</u> olumes, si	ze					

Note: Open compressed file to see if there are any idle files. If yes, delete them. Otherwise animation will fail when booting.



2.9.3.2 Replace boot animation:

Step 1: Open the firmware factory tool

名称	修改日
📙 bin	2017/
👃 config	2017/
📙 Language	2017/
📙 Log	2017/0
📙 Output	2017/0
👃 Plugin	2017/
📙 Temp	2017/0
🛐 config.ini	2014/
FWFactoryTool.exe	2014/

		C			
mware factory tool v4.4	and a la females	and the second party	· Constraint an	* 4 \	
Firmware				Prompt	
STEM SETTING		Logo config			
		Replace hoot logo Repl	ace hoot anim Renlace wal	Inaper Renalce charge anim	
Company	Model number	Boot logo Boot avination	Default wallnamen	(optico citargo anim)	
uild number			i serder (warrhaper		
SDK version					
3B info					
USB factory					
Disk volume					
/stem config					
PI setting	Bluetooth De	vice			
ace boot rir		open	5/2		
		APK config(Use right but)	ton to add or del)		
zs status clone		System apr Preinstall ap	JK		
N		File name	File size	File date	
system settings, brow	ser settings, preinstall apks	line etc.			
	SYSTEM_C	LUNE			



Step 2: Click "Firmware" and open the firmware

STEM SETTING					Jnpack system.img ok, System(Current
IDIDA DDITINO				(Jir/Temp/System)
System info		Logo config			
Company	Model number	Replace boot logo Replace boot an	nim Replace w	allpaper Repalce cha	irge anim
		Boot logo Boot animation Default w	allpaper		
Build number					
SDK version					
ISB inf∘					
USB factory					
Disk volume		Information			
veter config					
System Connig		Inpack firmware ok			
DPI setting	Bluetooth Device				
lace boot rir	open	确定	n del)		
			r uer)		
Sys status clo	ne	F/1		Rile dete	
		File name	File size	File date	
You can clon system setti:	e all settings in device into firmwork, like ngs, browser settings, preinstall apks etc.				
	SYSTEM_CLONE				

Step 3: Boot animation is not in the firmware. Click "OK" to continue.

	:\Users\Administrator\Desktop\update-7inch-3.3v	-beep-all.img			Unpack system.img ok,System(Curr
STEM SETTING					dir\Temp\System)
ystem info	197	Logo config			
		Replace host loss Replace host	anim Replace #	allnaper Repalce	charge anim
Company	rockchip Model number rk3188	Kepface Boot Togo Kepface Boot	anim (Repiace w	aripaper (acpared	, charge anna
	-10100 4 4 4 2710101410 00120010 1500	Boot logo Boot animation Defaul	t wallpaper		
suild number	rk3188-eng 4.4.4 klu840 eng. s1410.20170613.1522				
SDK version	RK30 ANDROID\$ (PLATFORM VERSION) - SDK-v1. 00.00 \				
bba verbron			~~		
			•		
SB inf∘					
USB factory	rockchip_usb				
	RockChins	irmware tools			
D.1 1 1	it o on on a po				
Disk volume					
Disk volume					
Disk volume System config		There is not boot animation in firmware	e!		
Disk volume ystem config	120	There is not boot animation in firmware			
Disk volume ystem config DPI setting	120 Sluetooth Device	There is not boot animation in firmware		\cap	Fixel:512x512
Disk volume ystem config DPI setting	120 Sluetooth Device	There is not boot animation in firmware 确定			Pixel:512x512 NaxPixel:512x512
Disk volume /stem config DPI setting .ace boot rir	120 V Bluetooth Device	There is not boot animation in firmware		\supset	Pixel:512x512 MaxPixel:512x512
Disk volume ystem config DPI setting lace boot rir	120 Sluetooth Device	There is not boot animation in firmware இத காக contiguouse right putton to a		D	Pixel:512x512 MaxPixel:512x512
Disk volume ystem config DPI setting lace boot rir	120 V Bluetooth Device	There is not boot animation in firmware 確認 AFA configUse right button to an System apk Preinstall ank		\supset	Pixel:512x512 MaxPixel:512x512
Disk volume ystem config DPI setting lace boot rir ys status clo	120 Elustooth Device	There is not boot animation in firmward)	Fixel:512x512 MaxPixel:512x512
Disk volume ystem config DPI setting lace boot rir ys status clo	120 Bluetooth Device	There is not boot animation in firmware ага conriguuse right putton to an System apk Preinstall apk File name	e!	File date	Pixel:512x512 MaxPixel:512x512
Disk volume ystem config DPI setting lace boot rir ys status clo You can clo	120 Bluetooth Device open	There is not boot animation in firmware 確認 AFA configuse right button to an System apk Preinstall apk File name EasicDreams.apk	e! aa or ael) File size SI K	File date 17-06-13	Pixel:512x512 MaxPixel:512x512
Disk volume ystem config DPI setting lace boot rin ys status clo You can clo system setti	120 Bluetooth Device open one ne all settings in device into firmwork, like ings, browser settings, preinstall apks etc.	There is not boot animation in firmward	e! aa or ael) File size 31 K 776 K	File date 17-06-13 17-06-13	Pixel:512x512 MaxPixel:512x512
Disk volume ystem config DPI setting Lace boot rir ys status clo You can clo system setti	120 Bluetooth Device open ne all settings in device into firmwork, like ings, browser settings, preinstall apks etc.	There is not boot animation in firmware هت אדג configuse right button to an System apk Preinstall apk File name BasicDreams.apk Bluetooth.apk Brovser.apk	el aa or ael) File size 31 K 776 K 3001 K	File date 17-06-13 17-06-13 17-06-13	Pixel:512x512 MaxPixel:512x512
Disk volume /stem config DPI setting .ace boot rin /s status clo You can clo system sett	120 Device open	There is not boot animation in firmware 確定 AFA configure right putton to an System apk Preinstall apk File name BasiCDreams.apk Bluetooth.apk Browser.apk Camera.apk	e! aa or ael) File size SI K 776 K SOOI K 4837 K	File date 17-06-13 17-06-13 17-06-13 17-06-13	Fixel:512x512 MaxPixel:512x512
Disk volume /stem config /PI setting .ace boot rin /s status clo System setti	120 V Bluetooth Device open one ne all settings in device into firmwork, like ings, browser settings, preinstall apks etc.	There is not boot animation in firmward ara configure right putton to an System apk Freinstall apk File name BasicDreams.apk Bluetooth.apk Browser.apk Camera2.apk Certinstaller.apk	e! aa or ael) File size 31 K 776 K 3001 K 4337 K 150 K	File date 17-06-13 17-06-13 17-06-13 17-06-13 17-06-13	Pixel:512x512 MaxPixel:512x512
Disk volume ystem config DPI setting lace boot rir ys status clo You can clo system setti	120 Device open	There is not boot animation in firmware ark configure right button to an System apk Preinstall apk File name BasicDreams.apk Bluetooth.apk Camera2.apk CertInstaller.apk Development.apk	e! aa or ael) File size 31 K 776 K 3001 K 4837 K 150 K 105 K	File date 17-06-13 17-06-13 17-06-13 17-06-13 17-06-13 17-06-13 17-06-13	Pixel:512x512 NaxPixel:512x512
Disk volume ystem config DPI setting lace boot rir ys status clo you can clo system sett!	120 Eluctooth Device open one ne all settings in device into firmwork, like ings, browser settings, preinstall apks etc.	There is not boot animation in firmward arX configuous right cutton to an System apk Freinstall apk File name apk Bluetooth.apk Browser.apk Canera2.apk CertInstaller.apk Development.apk DocumentsUI.apk	e! File size S1 K 776 K 3001 K 4837 K 150 K 105 K 461 K	File date 17-06-13 17-06-13 17-06-13 17-06-13 17-06-13 17-06-13 17-06-13	Fixel:512x512 MaxPixel:512x512
Disk volume hystem config DPI setting lace boot rin hys status clo You can clo system setti	120 Bluetooth Device open one ne all settings in device into firmwork, like ings, browser settings, preinstall apks etc.	There is not boot animation in firmward	e! aa or ael) File size 31 K 776 K	File date 17-06-13 17-06-13	Pixel:512x512 MaxPixel:512x512
Disk volume ystem config DPI setting lace boot rir ys status clo You can clo system sett!	120 Device open	There is not boot animation in firmware 確認 AFK configure right button to an System apk File name BasicDreams.apk Bluetooth.apk Browser.apk Camera2.apk Camera2.apk	el aa or ael) File size 31 K 776 K 3001 K 4837 K 150 K	File date 17-06-13 17-06-13 17-06-13 17-06-13 17-06-12	Pixel:512x512 MaxPixel:512x512
Disk volume /stem config /PI setting .ace boot rir /s status clo You can clo system sett	120 Bluetooth Device open ne all settings in device into firmwork, like ings, browser settings, preinstall apks etc.	There is not boot animation in firmware and Ark configure right button to an System apk Preinstall apk File name BasicDreams.apk Bluetooth.apk Browser.apk Careta2.apk Certinstaller.apk	e! aa or ael) File size SI K 776 K SOOI K 4837 K 150 K	File date 17-06-13 17-06-13 17-06-13 17-06-13 17-06-13	Pixel:512x512 MaxPixel:512x512
Disk volume ystem config DPI setting ace boot rin ys status clo You can clor system sett!	120 Bluetooth Device open one ne all settings in device into firmwork, like ings, browser settings, preinstall apks etc.	There is not boot animation in firmward arA configuose right cutton to an System apk Freinstall apk File name Basicoreans.apk Bluetooth.apk Browser.apk Canera2.apk Carera2.apk Carera2.apk Carera2.apk Carera2.apk Carera2.apk Carera2.apk Carera2.apk Carera2.apk Carera2.apk	e! aa or ael) File size Si K 776 K Sool K 4837 K 150 K 155 K	File date 17-06-13 17-06-13 17-06-13 17-06-13 17-06-13 17-06-13 17-06-13	Pixel:512x512 MaxPixel:512x512
Disk volume Astem config PI setting ace boot rin As status clo You can clor System sett	120 Bluetooth Device open e all settings in device into firmwork, like ings, browser settings, preinstall apks etc.	There is not boot animation in firmware 和子 configure right putton to an System apk Preinstall apk File name BasicDreams.apk Bluetooth.apk Cortinstaller.apk Development.apk Development.apk	File size SI K 776 K SOOL K 4837 K 150 K 105 K 441 K	File date 17-06-13 17-06-13 17-06-13 17-06-13 17-06-13 17-06-13 17-06-13 17-06-13	Pixel:512x512 WaxPixel:512x512
Disk volume rstem config PFI setting ace boot rir rs status clo You can clor system setti	120 Pluetooth Device open one ne all settings in device into firmwork, like ings, browser settings, preinstall apks etc. SYSTEM_CLONE	There is not boot animation in firmware Main and a set of the set	e! File size S1 K 776 K 3001 K 4837 K 150 K 105 K 461 K 204 K	File date 17-06-13 17-06-13 17-06-13 17-06-13 17-06-13 17-06-13 17-06-13 17-06-13	Pixel:512x512 MaxPixel:512x512



Firmware	D:\Proculus\Products\Android\upda	te-rk31-7inch.img					Unpack system.ir	mg
SYSTEM SETTING							ok,System(Currer	nt
System info			Logo config					
Company	rockchip Model number r	13188	Replace boot logo Re	eplace boot anim	Replace wal	lpaper Rep	dce charge anim	
			Boot logo Rest uninge	tion Defends well				
Build number	rk3188-eng 4.4.4 KTU84Q eng.sl410	. 20180209. 1800	Doot Togo Doot anima	CION Deladic wall	rhahei			_
SDK version	RK30_ANDROID\$ (PLATFORM_VERSION)-S	DK-v1.00.00 \				,		
	ſ	シ打开						
USB info								
USB factory	rockchip_usb	Look in: 🥼 And	droid	- 9 0 0				
		Name				^ <u> </u>		
Dirle wolume	KockChips	100.000						
DISK VOLUME		SerialportAp	pi.zip					
DISK VOLUME		SerialportAp	oi.zip ol_Release_v2.35_for Linux_EN	N.zip				
System config		SerialportAp	oi.zip ol_Release_v2.35_for Linux_EN ion.zip	N.zip				
System config	120	SerialportAp AndroidToo	pi.zip I_Release_v2.35_for Linux_E№ ion.zip nt_v4.2.zip	N.zip		н		
System config DPI setting	120 V Blueto	AndroidToo bootanimati	oi.zip IJ_Release_v2.35_for Linux_EN ion.zip nt_v4.2.zip ictory Tool.zip	V.zip				ixel:512x512
System config DPI setting	120 V Blueto	SerialportAp	oi.zip IJ_Release_v2.35_for Linux_EN ion.zip nt_v4.2.zip ictory Tool.zip III	V.zip				'ixel:512x512 Pixel:512x512
System config DPI setting place boot rir	120 V Blueto	SerialportAp	ivizip <u>J</u> Release_v2.35_for Linux_EN ion.zip nt_v4.2.zip ketory Tool.zip III	N.zip			P Max	'ixel:512x512 Fixel:512x512
System config DPI setting place boot rir	120 V Blueto	SerialportAp AndroidToo bootanimati DriverAssitai Firmware Fa File name: bo	ji.zip I_Release_v2.35_for Linux_EN ion.zip nt_v4.2.zip ketory Tool.zip "" ootanimation zip	N.zip	► Open		P Max	ixel:512x512 Pixel:512x512
System config DPI setting place boot rin Sys status cl	120 Ø Blueto	SerialportAp AndroidToo bootanimati DriverAssitar File name: bo Files of type: Bo	ji.zip I_Release_v2.35_for Linux_EN ion.zip nt.v4.2.zip ktory Tool.zip m ootanimation zip	V.zip	Open Cancel		P Max	'ixel:512x512 Fixel:512x512
System config DPI setting place boot rin Sys status cle	120 Ø Blueto	SerialportAp AndroidToo bootanimati DriverAssita Firmware Fa File name: bo Files of type: Bo	i.zip Release_v2.35_for Linux_EN ion.zip nt.ut_v4.2.zip ntory Tool.zip m ootanimation.zip	V.zíp	Open Cancel		P Max	ixel:512x512 Fixel:512x512
System config DPI setting place boot rin Sys status clo You can clon	120 I Blueto	SerialportAp AndroidToo bootanimati FriverAssitar File name: bo Files of type: Bo work. Like	ji.zip Release_v2.35_for Linux_EN ion.zip nt_v4.2.zip tctoy Tool.zip m ootAnimation BasicDreams.apk	N.zip	Open Cancel	size	File date 18-02-09	ixel:512x512 Pixel:512x512
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Step 4: Click "Replace Boot Animation" button and import the animation created in Step 1.



Step 5: Preview boot animation:

Firmware	:\Users\Administrator\Desktop\update-7inch-3.3v-be	eep-all.img			Unpack system	n.img ok,System(Curr
YSTEM SETTING					dir\Temp\Syste	em)
System info		Logo config				
-		Replace hoot logo Replace hoo	at anim Replace w	allnaner Renal	lce charge anim	
Company	rockcnip Model number rk3188					
Duild number	rk2199-eng 4 4 4 KTU940 eng c1410 20170612 1525	Boot logo Boot animation Defau	ilt wallpaper			
buitu number	1K3100 CHg 1. 1. 1 K10010 CHg. 51410. 201/0013. 1322					
SDK version	RK30_ANDROID\$(PLATFORM_VERSION)-SDK-v1.00.00 \					
ICR info						
00 11110						
USB factory	rockchip_usb					
			5			
Disk volume	RockChips					
DIGN FOIGHT						
DISK VOIGHE			A.			
System config			L.			
Dystem config DPI setting	120 Bluetooth Device					
ystem config DPI setting	120 V Bluetooth Device					
ystem config DPI setting	120 I Bluetooth Device		AC.			Pixel:480x800
ystem config DPI setting Lace boot rir	120 Sluetooth Device					Pixel:480x800
ystem config DPI setting Lace boot rir	120 I Bluetooth Device	AFK config(Use right button to	add or del)			Pixel:480x800
ystem config DPI setting Lace boot rir	120 V Bluetooth Device	APK config(Use right button to System apk Preinstall apk	add or del)			Pixel:480x800
/stem config /PI setting .ace boot rir /s status clo	120 Sluetooth Device	APK config(Use right button to System apk Preinstall apk File name	add or del) File size	File date		Pixel:480x800
/stem config /PI setting .ace boot rir /s status clo	120 Sluetooth Device	APK config(Use right button to System apk Preinstall apk File name BasicDreams, ank	add or del) File size 31 K	File date 17-06-13		Pixel:480x800
/stem config /PI setting .ace boot rir /s status clo You can clor	120 ✓ Eluetooth Device open	APK config(Use right button to System apk Preinstall apk File name BasicDreams.apk Bluetooth.apk	add or del) File size 31 K 776 K	File date 17-06-13 17-06-13		Pixel:480x800
ystem config PFI setting ace boot rir /s status clo You can clon system setti	120 Sluetooth Device open e all settings in device into firmwork, like ings, browser settings, preinstall apks etc.	APK config(Use right button to System apk Preinstall apk File name BasicDreams.apk Bluetooth.apk Erowser.apk	add or del) File size 31 K 776 K 3001 K	File date 17-06-13 17-06-13 17-06-13		Pixel:480x800
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/stem config /PI setting .ace boot rir /s status clo You can clon system setti	120 Iluetooth Device open one ne all settings in device into firawork, like ings, browser settings, preinstall apks etc.	APK config(Use right button to System apk File name BasicDreams.apk Bluetooth.apk Browser.apk Camera2.apk CertInstaller.apk	add or del) File size 31 K 776 K 3001 K 4837 K 150 K	File date 17-06-13 17-06-13 17-06-13 17-06-13 17-06-13		Pixel:480x800
ystem config DPI setting Lace boot rir ys status clo You can clon system setti	120 Sluetooth Device open one ne all settings in device into firmwork, like ings, browser settings, preinstall apks etc.	APK config(Use right button to System apk Preinstall apk File name BasicDreans.apk Bluetooth.apk Browser.apk Camera2.apk CertInstaller.apk Development.apk	add or del) File size 31 K 776 K 3001 K 4837 K 150 K 105 K	File date 17-06-13 17-06-13 17-06-13 17-06-13 17-06-13 17-06-13		Pixel:480x800
ystem config DPI setting lace boot rir ys status clo You can clon system setti	120 Bluetooth Device open one ne all settings in device into firawork, like ings, browser settings, preinstall apks etc.	APK config(Use right button to System apk Preinstall apk File name BasicDreams.apk Bluetooth apk Browser.apk Camera2.apk CertInstaller.apk Development.apk	add or del) File size 31 K 3001 K 4837 K 150 K 105 K 461 K	File date 17-06-13 17-06-13 17-06-13 17-06-13 17-06-13 17-06-13 17-06-13		Pixel:480x800
ystem config DPI setting lace boot rir ys status clo You can clon system setti	120 Sluetooth Device open e all settings in device into firmwork, like ings, browser settings, preinstall apks etc. SYSTEM_CLONE	APK config(Use right button to System apk Preinstall apk File name BasicDreams.apk Bluetooth.apk Browser.apk Cenera2.apk CertInstaller.apk Development.apk DownloadProviderUi.apk	add or del) File size 31 K 776 K 4837 K 4837 K 105 K 461 K 224 K	File date 17-06-13 17-06-13 17-06-13 17-06-13 17-06-13 17-06-13 17-06-13		Pixel:480x800



Step 5: Save boot animation

Firmware	::\Users\Administrator\Desktop\u	odate-7inch-3.3v-b	eep-all.ing				Unpack system.img ok,System(Curre
STEN SETTING							dir(Temp(System)
ystem info			Logo config				
Company	rockchip Model number	rk3188	Replace boot 1	logo Replace boot a	nim Replace	wallpaper Repalce ch	arge anim
D	wk2199-ong 4 4 4 WTII940 ong al4	0 20170612 1525	Boot logo Boot	t animation Default	vallpaper		
bullu number	183100 CHg 4.4.4 810040 CHg.514	10. 20110013. 1322					
SDK version	RK30_ANDROID\$ (PLATFORM_VERSION)	-SDK-v1.00.00 \					
SB info		🗊 open				×	
USB factory	rockchip_usb	保存在(I):	桌面	- O	1 🖻 🛄 🔻		
Disk volume	RockChips						
		Android	Tool_Release				
ystem config		文件夹					
DPI setting	120 Rivet	bootan	mation(1)				
		文件夹				III.	D: 1 100 000
lace boot rir		The Compo					FIXE1:460X600
		Combe 文件夹	m020160602				
ys status clo	ne						
		Factory	ToolV4.4			e date	
You can clon	ne all settings in device into fi					06-13	
System Setti		faq				₩ 06-13	
		文件名(N): ne	wBootanimation.in	ng	保存(S)	06-13	
		保存类型(I): i	g Files(*.ing)		· 取迷	06-13	
	S				40.78	06-13	
				•	1000 1	1.7 07 10	
4-20140411		dift hatten		Wadify Kay Manna	a	Wodify Buildmon	Confirm Rodifactio

*Note: The file must be *.img format.*

2.10 Firmware Burning Process

Step1: Open AndroidTool.exe

Download Link: www.proculustech.com/SoftwareResources/AndroidTool_Release.zip

Documents library AndroidTool_Release_V2.1_EN			
Name	Date modified	Туре	Size
🍌 Log	2018/8/10 14:39	File folder	
퉬 Language	2017/7/4 11:12	File folder	
🎉 bin	2017/7/4 11:10	File folder	
🔊 config.ini	2017/7/4 11:12	Configur	2 KB
🗋 config.cfg	2014/3/26 11:52	CFG File	5 KB
config-android.cfg	2014/3/26 11:52	CFG File	5 KB
config-linux.cfg	2014/3/26 11:52	CFG File	5 KB
🔨 AndroidTool.exe	2014/2/26 16:05	Applicati	997 KB

Step2: Connect the device and select the firmware you want to burn

First it will show 1 "Found One MSC Device", second click 2 "Upgrade Firmware", then click 3 "Firmware", and select the firmware you want to burn.

EwVar	4.4.02	Loader Ver	2.15	Chin Info:	RE31		
Firmware.	C:\Users\	vin7\Desktop\RK_1	TOOL\AndroidTo	ol_Releaze_	e2. 1\rockdet		
Demo		4					



Click 1 "Switch", and it will show 2 "Found One LOADER Device" after succ	cess.
---	-------

wnload Image	Upgrade Firmware Advanced Function	Switch MSC Start Switch MSC Success	
Firmware	Upgrade Switch EraseFlash		
Fw Ver:	4. 4. 02 Loader Ver: 2. 15 Chip Info: RK31		
Firmware:	C:\Users\win7\Desktop\RK_TOOL\AndroidTool_Release_v2.1\rockdet		
🔲 Demo			
2	<u></u>		
	Found One LOADER Device		

If you cannot load the firmware, please install the driver

Download Link:<u>http://www.proculustech.com/SoftwareResources/DriverAssitant.zip</u>

Algaren ▼ 共享 ▼ 刻录 名称 AndroidTool Release ↑ DriverAssitant_v4.2 Fockdev AndroidTool.rar	组织 ▼ 回 打开 刻录 新建文件3 名称 ADBDriver bin Driver Log Config.ini DriverInstall.exe	★ ● 瑞芯微驱动助手 v4.2 ▲ 驱动安装 驱动卸載
.0	Readme.txt	



ownload Image	Upgrade Firmware Advanced Function		Test Device Start Test Device Success	
Firmware	Upgrade Switch EraseFlash		Check Chip Start Check Chip Success	
1			Get FlashInfo Start	
Fw Ver:	4. 4. 02 Loader Ver: 2. 15	Chip Info: RK31	Prepare IDB Start	
Firmware:	C:\Users\win7\Desktop\RK_TOOL\Android	fool_Release_v2.1\rockdet	Frepare LHB Success Download IDB Start Download IDB Success Reset Device Start	
🗌 Demo			Reset Device Success Wait For Loader Start Wait For Loader Success	
			Test Device Start	
			lest Device Success Download Firmware Start	
			Download Firmware(7%)	
			1	
	Found One LOADER D	evice	2	

Step3: Upgrade and show "Reset Device Success" after burning succeeded.

iload Image	Upgrade Fi	rmware Advar	nced Function			Test Device Start Test Device Success
Firmware	Upgrade	Switch	EraseFlash			Check Chip Start
						Check Chip Success
						Get FlashInfo Start
Fw Ver:	4.4.02	Loader Ve	er: 2.15	Chip Info:	RK31	Get FlashInfo Success
						Prepare IDE Start
	T·\123456	6\undate-rk31	-7inch img			Prepare IDE Success
Firmware:	1. (120100	s (sponte indi	intoin imp			Download IDB Start
						Pownioau IDD Success
Damas	-					Reset Device Start
Demo						Wait For Loader Start
						Wait For Loader Success
						Test Device Start
						Test Device Success
						Download Firmware Start
						Download Firmware(100%)
						Check Firmware(100%)
						Download Firmware Success
						Reset Device Start
						Reset Device Success
						L
	F	Found Or	MSC De	wico		
	1	ound of	it mot De	VICE		
	ł	Found Or	ne MSC De	vice		



2.11 Others

Demo Downloading Link: http://www.proculustech.com/SoftwareResources/zg_demo.rar

Step 1: Import Class RootShellCmd.java

Download link: http://www.proculustech.com/SoftwareResources/RootShellCmd.java

Step 2: Invoke in Main class

2.11.1 Adjust brightness RootShellCmd.getInstance().setBrightness(0);

2.11.2 Home button RootShellCmd.getInstance().home();

2.11.3 Back button RootShellCmd.getInstance().back();

2.11.4 Dynamic shutdown RootShellCmd.getInstance().shutDown();

2.11.5 Dynamic reboot

RootShellCmd.getInstance().reboot();



3. Matters Needing Attention

3.1 Possible Problems In JAVA Installation

1. How to check if my OS is 32-bit or 64-bit?

A: "Start" -> "Run", input "CMD" and enter. Input "systeminfo" and enter. You can find it in "System Type" (x86 means 32-bit. X64 means 64-bit).

Administrator: C:\Windows\system	32\cmd.exe	x	
OS Version:	6.1.7601 Service Pack 1 Build 7601		
OS Manufacturer:	Microsoft Corporation		
OS Configuration:	Standalone Workstation		
OS Build Type:	Multiprocessor Free		
Registered Owner:	08		
Registered Organization:			
Product ID:	00426-0EM-8992662-00537		
Original Install Date:	2017/4/14, 9:47:42		
System Boot Time:	2018/9/10, 7:51:06		
System Manufacturer:	LENOUO		
System Model:	20378		
System Type:	x64-based PC		
Processor(s):	1 Processor(s) Installed.		
	[01]: Intel64 Family 6 Model 60 Stepping 3 GenuineInt		
el ~2901 Mhz			
BIOS Version:	LENOUO 9ECN31WW(U1.14), 2014/8/18		
Windows Directory:	C: Windows		
System Directory:	C:\Windows\system32		
Boot Device:	\Device\HarddiskVolume1		
System Locale:	zh-cn;Chinese (China)		
Input Locale:	zh-cn;Chinese (China)		
Time Zone:	(UTC+08:00) Beijing, Chongqing, Hong Kong, Urumqi		
Total Physical Memory:	4,012 MB		
Available Physical Memory:	322 MB		
Virtual Memory: Max Size:	8,023 MB		
Virtual Memory: Available:	2,327 MB		
Virtual Memory: In Use:	5,696 MB		
Page File Location(s):	C:\pagefile.sys		
Domain:	WorkGroup		
Logon Server:	\\0S-201704140943		

3.2 Possible Problems In Android Studio Installation

Android Studio must work with JDK8 or above version.

3.3 Serial Port

1. PATH

There are many serial ports on Android LCM, therefore it must be clearly aware of the path of the serial port (Do NOT invoke serial port 2 as it is system serial port).

2. Baud rate

Baud rate is the transmission speed which is crucial. If LCM can receive information but cannot work, it's quite possible that baud rate is not right.

3. Gibberish

Gibberish is usually caused by the inconsistent of sending and receiving. Check if send & receive



baud rates, check bits, stop bits are consistent, or if the formats of data are consistent (HEX or ASCII).

4. Abnormal in data receiving & sending

First, check the cable connection. Most problems are caused by bad connections of the cables; Second, Android LCM comes with a serial testing file. Short circuit DB9 transceiver and run the apk file to see if it's working fine;

3.4 USB Device

USB Device is recognized automatically when connecting to Internet. It will needs confirmation when offline. Android LCM will recognize automatically when USB connect to DEBUG interface.

If PC is connecting too many USB drive, it could possibly cause connection exception. USB drive should be inserted into USB0. Device Manager will refresh and install new device. If not, please check the connection.

If it popup to install driver, go on with the auto-search.

After installation, there will be an "Android Tablet" in Device Manager. Check if there is an exclamatory mark on it. If yes, remove this driver and plug USB again.

3.5 Android LCM can't Connect to PC

- 1. Reinstall the driver;
- 2. Unplug and plug the USB again;
- 3. Reboot the LCM;
- 4. PC can only communicate with one Android device once.