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RK3399Pro_ANDROID9.0_SDK 发布说明

RK3399Pro_ANDROID9.0_SDK_Release_Instruction

（技术部，第二系统产品部）

(Technical Department, R & D Dept. II)

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福州瑞芯微电子股份有限公司

Fuzhou Rockchip Electronics Co., Ltd

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目 录 Content

1 概述 Overview

本 SDK 是基于谷歌 Android9.0 64bit 系统，适配瑞芯微 RK3399Pro 芯片的软件包。

This SDK is compatible with Rockchip RK3399Pro chipset software package based on Google Android9.0 64bit system.

2 主要支持功能 Main Functions

参数 Parameter	模块名 Module Names
数据通信 Data communication	Wi-Fi、USB 以太网卡、USB、SDCARD Wi-Fi、USB Ethernet card、USB、SDCARD
应用程序 Application	Launcher3、APK 安装器、浏览器、计算器、日历、相机、闹钟、下载、电子邮件、资源管理器、GMS 应用、音乐、录音、设置、视频播放器 Launcher3、APK installer、browser、calculator、calendar、camera、clock、download、e-mail、resource manager、GMS application、music、audio recorder、setting、video player

3 SDK 获取说明 SDK Acquisition

3.1 获取 SDK How to get SDK

SDK 通过瑞芯微代码服务器对外发布。其编译开发环境，参考附录 A 编译开发环境搭建。

SDK is released through Rockchip code server. Please refer to Appendix A to setup the compiling and development environment.

客户向瑞芯微技术窗口申请 SDK，需同步提供 SSH 公钥进行服务器认证授权，获得授权后即可同步代码。关于瑞芯微代码服务器 SSH 公钥授权，请参考附录 B SSH 公钥操作说明。

Customers apply SDK from Rockchip FAE contact, and will be able to sync code after obtaining the server certificate authorization with SSH public key. For more details about Rockchip code server SSH public key authorization, please refer to Appendix B SSH public key operation instruction.

RK3399PRO_ANDROID9.0_SDK 下载地址如下：

RK3399PRO_ANDROID9.0_SDK download address is as below:

```
repo init --repo-url=ssh://git@www.rockchip.com.cn:2222/repo-release/tools/repo.git -u
ssh://git@www.rockchip.com.cn:2222/Android_pie_stable/platform/rk3399pro/manifests.git -m
Rk3399pro_Android_Pie_release.xml
```

注：repo 是 google 用 Python 脚本写的调用 git 的一个脚本，主要是用来下载、管理 Android 项目的软件仓库，其下载地址如下：

Note: repo is a script invoking git developed by Google using Python script, and mainly used to download, manage Android project software lib. The download address is as below:

```
git clone ssh:// git@www.rockchip.com.cn:2222/repo-release/tools/repo
```

为方便客户快速获取 SDK 源码，瑞芯微技术窗口通常会提供对应版本的 SDK 初始压缩包。以 Rk3399Pro_Android9.0_SDK_V1.00_20190806.tar.gz 为例，拷贝到该初始化包后，通过如下命令可检出源码：

Rockchip FAE contact usually will provide the initial compressed package of the corresponding version SDK in order to help customers acquire SDK source code quickly. Take Rk3399Pro_Android9.0_SDK_V1.00_20190806.tar.gz as an example, you can sync the source code through below command after copy the initial package:

```
mkdir rk3399pro
tar zxvf Rk3399Pro_Android9.0_SDK_V1.00_20190806.tar.gz -C rk3399pro
cd rk3399pro
.repo/repo/repo sync -l
.repo/repo/repo sync
```

注：我们会定期更新版本，以解决一些 SDK 发现的问题，请客户定期使用.repo/repo/repo sync 命令更新我们的版本。

Note: We may upgrade versions periodically to resolve some issues found in SDK. Customers can use the command .repo/repo/repo sync to upgrade the new versions periodically.

3.2 补充说明 Supplementary description

Android9.0 SDK 已不再支持 UMS 功能，平台设备皆使用合并分区；

Android9.0 SDK does not support UMS function any more, all the devices use combined partition.

Android9.0 SDK 已支持全盘加密功能；

Android9.0 SDK already supports full disk encryption function.

Android9.0 SDK 已支持 Verified boot 2.0 (AVB)的功能。

Android9.0 SDK already supports Android Verified Boot v2.0.

4 SDK 编译说明 SDK compiling instruction

4.1 JDK 安装 JDK installation

Android9.0 系统编译依赖于 JAVA 8。编译之前需安装 OpenJDK。

Android9.0 system compiling is dependent on JAVA 8. Need to install OpenJDK before compiling.

安装命令如下。

Install command is as below:

sudo apt-get install openjdk-8-jdk

配置 JAVA 环境变量，例如，安装路径为/usr/lib/jvm/java-8-openjdk-amd64，可在终端执行如下命令配置环境变量。

Configure JAVA environment variable, for example, if the install path is /usr/lib/jvm/java-8-openjdk-amd64, it is able to execute below command to configure environment variable at the terminal.

```
export JAVA_HOME=/usr/lib/jvm/java-8-openjdk-amd64
export PATH=$JAVA_HOME/bin:$PATH
export CLASSPATH=.:$JAVA_HOME/lib:$JAVA_HOME/lib/tools.jar
```

4.2 编译模式 Compiling mode

SDK 默认以 userdebug 模式编译。

SDK default compiling mode is userdebug.

使用 adb 时，需要先执行 adb root ，adb disable-verity 关闭 system 分区的 verity 特性，重启后再执行 adb root, adb remount，进而可以进行 push 操作来 debug。

While using adb, first need to execute adb root, adb disable-verity to close the verity feature of the system partition, then execute adb root, adb remount after reboot, and then execute push operation to debug.

4.3 代码编译 Code compiling

4.3.1 uboot 编译步骤 Uboot compiling steps

```
cd u-boot
./make.sh rk3399pro
```

编译完，会生成 trust.img、rk3399pro_loader_v1.22.115.bin、uboot.img 三个文件。

After compilation, it will generate three files: trust.img, rk3399pro_loader_v1.22.115.bin and uboot.img.

该 rk3399pro_loader_v1.22.115.bin 可兼容 DDR 类型及容量，默认运行频率为 800MHz。

rk3399pro_loader_v1.22.115.bin is compatible with different DDR types and sizes. The default running frequency is 800MHz.

4.3.2 kernel 编译步骤 kernel compiling steps

```
如果客户有拿到我们的 evb_v10 的硬件板子（绿色）kernel 编译方法如下：
If for evb_v10 board(green), kernel compiling method is as below:
cd kernel
make ARCH=arm64 rockchip_defconfig -j8
make ARCH=arm64 rk3399pro-evb-v10-avb.img -j12

如果客户有拿到我们的 evb_v11 的硬件板子（黑色）kernel 编译方法如下：
If for evb_v11 board(black), kernel compiling method is as below:
cd kernel
```

```
make ARCH=arm64 rockchip_defconfig -j8

make  ARCH=arm64  rk3399pro-evb-v11-avb.img  -j12
```

4.3.3 Android 编译及固件生成步骤 Android compiling and image build steps

客户按实际编译环境配置好 JDK 环境变量后，按照以下步骤配置完后，执行 make 即可。

Customers configure per below steps after configuring JDK environment variable according to the actual compiling environment, and then execute make.

android 编译:

Android compiling:

```
source build/envsetup.sh

lunch rk3399pro-userdebug

make -j12

./mkimage.sh
```

完成编译后，执行 SDK 根目录下的 mkimage.sh 脚本生成固件，所有烧写所需的镜像将都会拷贝于 rockdev/Image-xxx 目录。

After compiling finished, execute mkimage.sh script under SDK root directory to generate images. All the mirror files required for flashing will be copied to rockdev/Image-xxx directory.

```
rockdev/Image-xxx/
├── boot.img
├── dtbo.img
├── kernel.img
├── MiniLoaderAll.bin
├── misc.img
├── oem.img
├── parameter.txt
├── pcba_small_misc.img
```

```
├── pcba_whole_misc.img
├── recovery.img
├── resource.img
├── system.img
├── trust.img
├── uboot.img
├── vbmeta.img
└── vendor.img
```

得到所有镜像文件后，为了方便烧写及量产，通常可手动将这些单独的镜像通过脚本打包成为 update.img，具体打包方式参阅《Rockchip_RK3399Pro_Developer_Guide_Android9.0_Software_CN&EN》文档的 8.5 小节。

After acquiring all the mirror files, usually you can manually use the script to package them as update.img which is convenient for flashing and MP. For the detailed package method, please refer to Chapter 8.5 of Rockchip_RK3399Pro_Developer_Guide_Android9.0_Software_CN&EN.

注意：Android9.0 移除了 kernel.img/resource.img，这里的镜像仅供调试，原来的 kernel/resource 打包到了 boot 和 recovery 中；另外，增加了 vbmeta.img 和 dtbo.img，固件烧写的时候必须烧写这两个 img，否则系统无法开机。具体修改细节请参照文档：RKDocs/android/Rockchip_Introduction_Android9.0_System_New_Feature_CN&EN.pdf

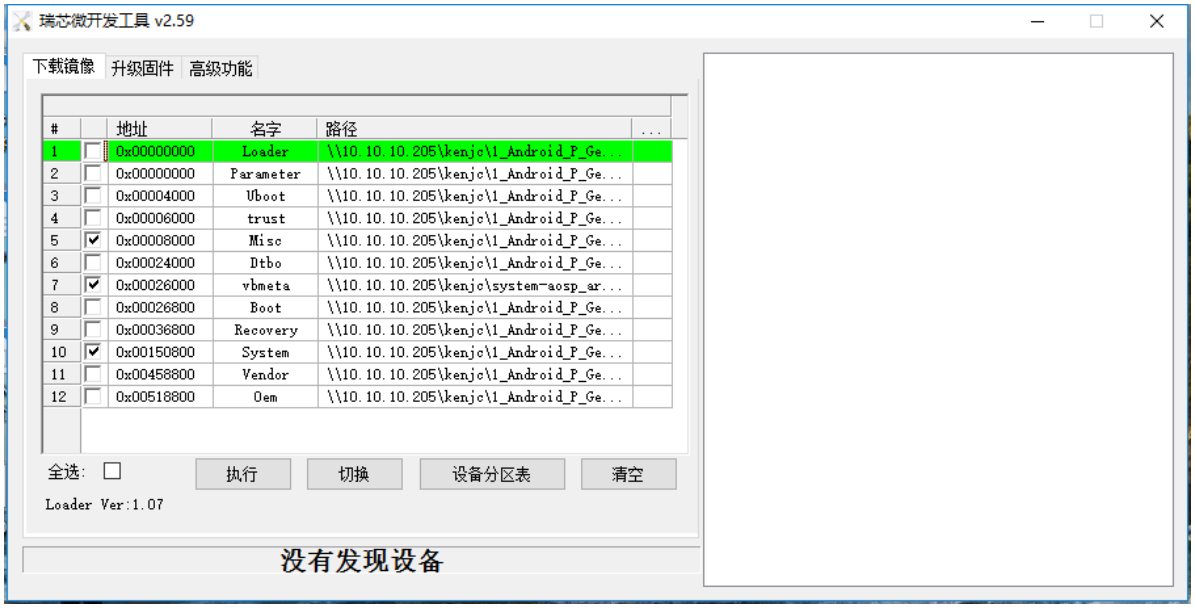
Note: kernel.img and resource.img are removed in Android 9.0 and these images are for debugging only. Now the kernel and resource are packaged into boot and recovery. In addition, Android 9.0 adds two new images: vbmeta and dtbo. These two images must be flashed during image flashing, otherwise the system will fail to boot up. For more details, please refer to the document: RKDocs/android/Rockchip_Introduction_Android9.0_System_New_Feature_CN&EN.pdf.

4.4 刷机说明 Flashing instruction

SDK 提供烧写工具，如下图所示，版本为 2.59。编译生成相应的固件后，进入 loader 模式，

即可进行刷机。对于已烧过其它固件的机器，请选择低格设备，擦除 idb，然后进行刷机。

SDK provides the flashing tool with version 2.59 shown as below picture. After compiling to generate images, enter loader mode, and then you can flash the images. For those devices with existing images, please select to format the device, erase idb, and then flash the images.



注：烧写工具必须使用 2.59 及以上版本的工具，量产工具使用 1.6 及以上版本；linux 下的烧写工具使用 1.34 及以上版本

Note: The flashing tool version must be 2.59 or later, and the MP tool version must be 1.6 or above. Linux flashing tool version must be 1.34 or later.

附录 A 编译开发环境搭建 Appendix A Compiling and development environment setup

1. Initializing a Build Environment

This section describes how to set up your local work environment to build the Android source files. You must use Linux or Mac OS; building under Windows is not currently supported.

For an overview of the entire code-review and code-update process, see Life of a Patch.

Note: All commands in this site are preceded by a dollar sign ($) to differentiate them from output or entries within files. You may use the Click to copy feature at the top right of each command box to copy all lines without the dollar signs or triple-click each line to copy it individually without the dollar sign.

2. Choosing a Branch

Some requirements for the build environment are determined by the version of the source code you plan to compile. For a full list of available branches, see Build Numbers. You can also choose to download and build the latest source code (called master), in which case you will simply omit the branch specification when you initialize the repository.

After you have selected a branch, follow the appropriate instructions below to set up your build environment.

3. Setting up a Linux build environment

These instructions apply to all branches, including master.

The Android build is routinely tested in house on recent versions of Ubuntu LTS (14.04) and Debian testing. Most other distributions should have the required build tools available.

For Gingerbread (2.3.x) and newer versions, including the master branch, a 64-bit environment is required. Older versions can be compiled on 32-bit systems.

Note: See Requirements for the complete list of hardware and software requirements, then follow the detailed instructions for Ubuntu and Mac OS below.

4. Installing the JDK

The master branch of Android in the Android Open Source Project (AOSP) comes with prebuilt versions

of OpenJDK below prebuilts/jdk/ so no additional installation is required.

Older versions of Android require a separate installation of the JDK. On Ubuntu, use OpenJDK. See JDK Requirements for precise versions and the sections below for instructions.

For Ubuntu >= 15.04

Run the following:

```
sudo apt-get update
sudo apt-get install openjdk-8-jdk
```

For Ubuntu LTS 14.04

There are no available supported OpenJDK 8 packages for Ubuntu 14.04. The Ubuntu 15.04 OpenJDK 8 packages have been used successfully with Ubuntu 14.04. Newer package versions (e.g. those for 15.10, 16.04) were found not to work on 14.04 using the instructions below.

1. Download the .deb packages for 64-bit architecture from old-releases.ubuntu.com:

   openjdk-8-jre-headless_8u45-b14-1_amd64.deb with SHA256
   0f5aba8db39088283b51e00054813063173a4d8809f70033976f83e214ab56c0

   openjdk-8-jre_8u45-b14-1_amd64.deb with SHA256
   9ef76c4562d39432b69baf6c18f199707c5c56a5b4566847df908b7d74e15849

   openjdk-8-jdk_8u45-b14-1_amd64.deb with SHA256
   6e47215cf6205aa829e6a0a64985075bd29d1f428a4006a80c9db371c2fc3c4c

2. Optionally, confirm the checksums of the downloaded files against the SHA256 string listed with each package above. For example, with the sha256sum tool:

   ```
   sha256sum {downloaded.deb file}
   ```

3. Install the packages:

```
sudo apt-get update
```

Run dpkg for each of the .deb files you downloaded. It may produce errors due to missing dependencies:

```
sudo dpkg -i {downloaded.deb file}
```

To fix missing dependencies:

```
sudo apt-get -f install
```

Update the default Java version - optional

Optionally, for the Ubuntu versions above update the default Java version by running:

sudo update-alternatives --config javasudo update-alternatives --config javac

Note: If, during a build, you encounter version errors for Java, see Wrong Java version for likely causes and solutions.

Installing required packages (Ubuntu 14.04)

You will need a 64-bit version of Ubuntu. Ubuntu 14.04 is recommended.

```
sudo apt-get install git-core gnupg flex bison gperf build-essential zip curl zlib1g-dev gcc-multilib g++-multilib libc6-dev-i386 lib32ncurses5-dev x11proto-core-dev libx11-dev lib32z-dev ccache libgl1-mesa-dev libxml2-utils xsltproc unzip
```

Note: To use SELinux tools for policy analysis, also install the python-networkx package. Note: If you are using LDAP and want to run ART host tests, also install the libnss-sss:i386 package.

5. Configuring USB Access

Under GNU/linux systems (and specifically under Ubuntu systems), regular users can't directly access USB devices by default. The system needs to be configured to allow such access.

The recommended approach is to create a file /etc/udev/rules.d/51-android.rules (as the root user) and to

copy the following lines in it. <username> must be replaced by the actual username of the user who is authorized to access the phones over USB.

```
# adb protocol on passion (Rockchip products)
SUBSYSTEM=="usb", ATTR{idVendor}=="2207", ATTR{idProduct}=="0010", MODE="0600", OWNER="<username>"
```

Those new rules take effect the next time a device is plugged in. It might therefore be necessary to unplug the device and plug it back into the computer.

This is known to work on both Ubuntu Hardy Heron (8.04.x LTS) and Lucid Lynx (10.04.x LTS). Other versions of Ubuntu or other variants of GNU/linux might require different configurations.

References : http://source.android.com/source/initializing.html

附录 B SSH 公钥操作说明 Appendix B SSH public key operation instruction

附录 B-1 SSH 公钥生成 Appendix B-1 SSH public key generation

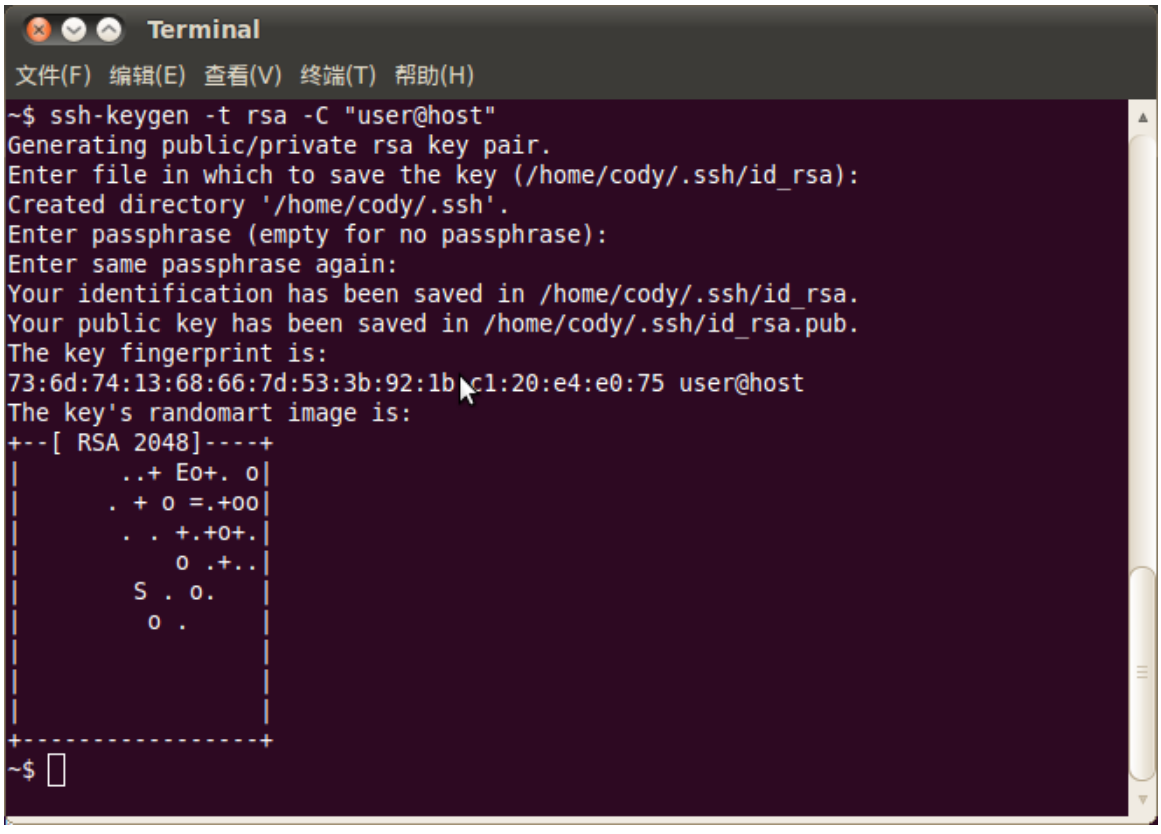
使用如下命令生成：

Use below command to generate:

```
ssh-keygen -t rsa -C "user@host"
```

请将 user@host 替换成您的邮箱地址。

Please replace user@host with your email address.



命令运行完成会在你的目录下生成 key 文件。

It will generate key file in your directory after the command executes successfully.

```
~$ ls -l .ssh/
总用量 8
-rw------- 1 cody cody 1675 2012-10-15 11:38 id_rsa
-rw-r--r-- 1 cody cody  391 2012-10-15 11:38 id_rsa.pub
```

请妥善保存生成的私钥文件 id_rsa 和密码，并将 id_rsa.pub 发邮件给 SDK 发布服务器的管理

员。

Please keep carefully the generated private key file id_rsa and password, and send id_rsa.pub to SDK release server admin through email.

附录 B-2 使用 key-chain 管理密钥 Appendix B-2 Use key-chain to manage the private key

推荐您使用比较简易的工具 keychain 管理密钥。

Recommend you use the simple tool keychain to manage the private key.

具体使用方法如下：

The detailed usage is as below:

1. 安装 keychain 软件包：

   Install keychain software package:

   $sudo aptitude install keychain

2. 配置使用密钥：

   Configure to use the private key:

   $vim ~/.bashrc

   增加下面这行：

   Add below command:

   eval `keychain --eval ~/.ssh/id_rsa`

   其中，id_rsa 是私钥文件名称。

   Among which, id_rsa is the file name of the private key.

以上配置以后，重新登录控制台，会提示输入密码，只需输入生成密钥时使用的密码即可，若无密码可不输入。

Log in the console again after configuring as above, it will prompt to input the password. Only need to input the password used for generating the private key if there is one.

另外，请尽量不要使用 sudo 或 root 用户，除非您知道如何处理，否则将导致权限以及密钥管理混乱。

Besides, please avoid using sudo or root user unless you know how to deal with, otherwise it will case the authority and private key management problems.

附录 B-3 多台机器使用相同 ssh 公钥 Appendix B-3 Multiple devices use the same ssh public key

在不同机器使用，可以将你的 ssh 私钥文件 id_rsa 拷贝到要使用的机器的“~/.ssh/id_rsa”即可。

In order to use on different devices, you can copy ssh private key file id_rsa to the target device “~/.ssh/id_rsa”.

在使用错误的私钥会出现如下提示，请注意替换成正确的私钥。

Below hint will show up if using the wrong private key. Please replace with the correct private key.

```
~/tmp$ git clone git@172.16.10.211:rk292x/mid/4.1.1_r1
Initialized empty Git repository in /home/cody/tmp/4.1.1_r1/.git/
The authenticity of host '172.16.10.211 (172.16.10.211)' can't be established.
RSA key fingerprint is fe:36:dd:30:bb:83:73:e1:0b:df:90:e2:73:e4:61:46.
Are you sure you want to continue connecting (yes/no)? yes
Warning: Permanently added '172.16.10.211' (RSA) to the list of known hosts.
git@172.16.10.211's password:
```

添加正确的私钥后，就可以使用 git 克隆代码，如下图。

After adding the correct private key, you can use git to clone code, shown as below picture:

```
~$ cd tmp/
~/tmp$ git clone git@172.16.10.211:rk292x/mid/4.1.1_r1
Initialized empty Git repository in /home/cody/tmp/4.1.1_r1/.git/
The authenticity of host '172.16.10.211 (172.16.10.211)' can't be established.
RSA key fingerprint is fe:36:dd:30:bb:83:73:e1:0b:df:90:e2:73:e4:61:46.
Are you sure you want to continue connecting (yes/no)? yes
Warning: Permanently added '172.16.10.211' (RSA) to the list of known hosts.
remote: Counting objects: 237923, done.
remote: Compressing objects: 100% (168382/168382), done.
Receiving objects:   9% (21570/237923), 61.52 MiB | 11.14 MiB/s
```

添加 ssh 私钥可能出现如下提示错误。

Below error may occur while adding ssh private key.

Agent admitted failture to sign using the key

在 console 输入如下命令即可解决。

Input below command at console to fix it.

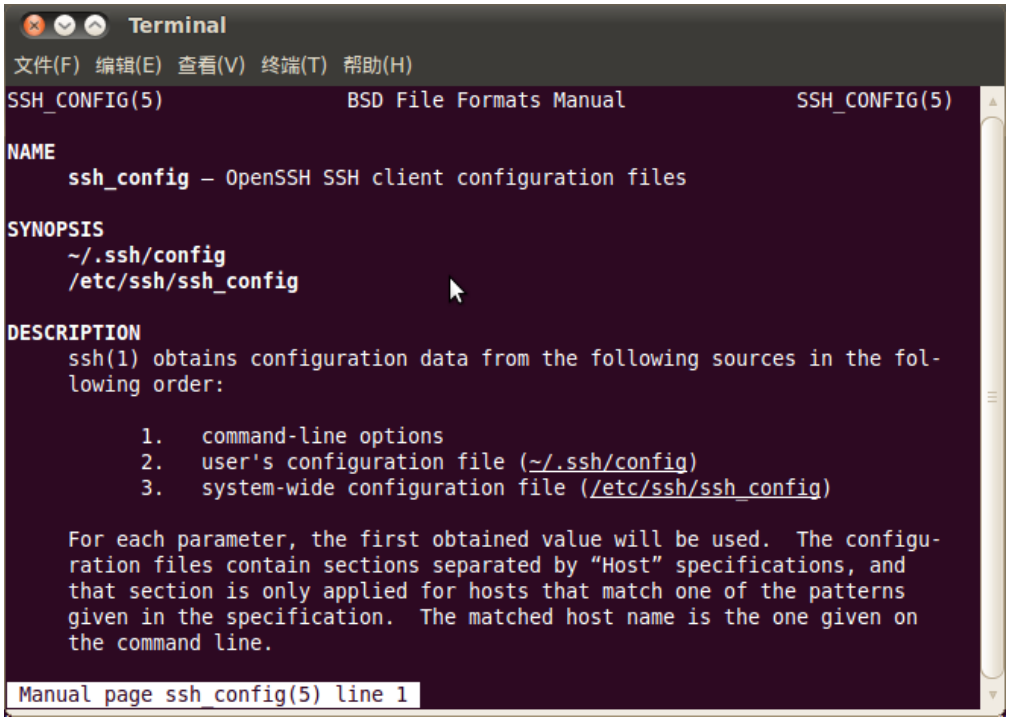
ssh-add ~/.ssh/id_rsa

附录 B-4 一台机器切换不同 ssh 公钥 Appendix B-4 Switch different ssh public keys on one device

可以参考 ssh_config 文档配置 ssh。

You can refer to ssh_config document to configure ssh.

~$ man ssh_config



通过如下命令，配置当前用户的 ssh 配置。

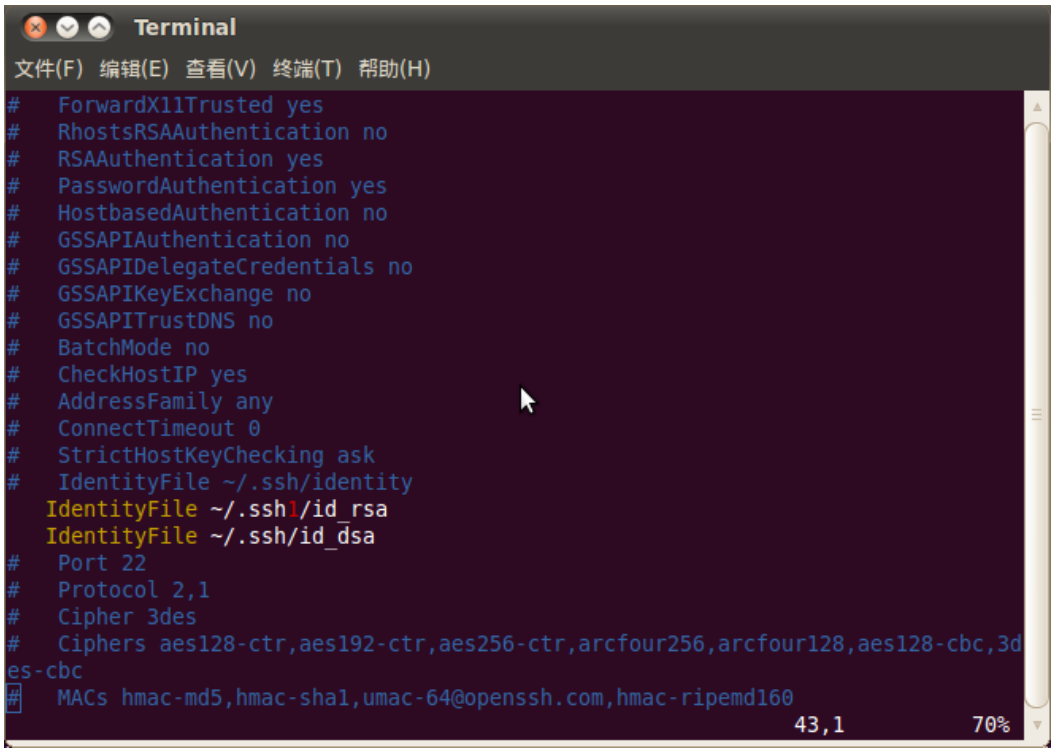
Use below commands to configure ssh for current user.

~$ cp /etc/ssh/ssh_config ~/.ssh/config

~$ vi .ssh/config

如图，将 ssh 使用另一个目录的文件“~/.ssh1/id_rsa”作为认证私钥。通过这种方法，可以切换不同的的密钥。

As below picture, identify another directory ssh file ”~/.ssh1/id_rsa” as certificate private key. In this way, you can switch different private keys.



附录 B-5 密钥权限管理 Appendix B-5 Private key authority management

服务器可以实时监控某个 key 的下载次数、IP 等信息，如果发现异常将禁用相应的 key 的下载权限。

The server can real-time monitor the information for the specific key such as the download times, IP etc. If there is abnormal case, it will prohibit the download authority of the corresponding key.

请妥善保管私钥文件。并不要二次授权与第三方使用。

Please keep carefully the private key file. DO NOT re-authorize it to the third party.

附录 B-6 Git 权限申请说明 Appendix B-6 Git authority application instruction

参考上述章节，生成公钥文件，发邮件至 fae@rock-chips.com，申请开通 SDK 代码下载权限。

Refer to above chapters, generate the public key file, and send email to fae@rock-chips.com applying for SDK code download authority.