Change History

Changes between document issues are cumulative. The latest document issue contains all the changes made in earlier issues.

Issue 01 (2018-03-11)

The first version.
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1.1 AUDIO

1.1.1 General description

The Audio module complies with the standard alsa framework and implements audio playback on the HDMI port. At the same time provides the HIFI DSP interactive driver, and it also achieves the use of dsp audio data pre-processing function in the android platform.

1.1.2 Features

1. Provides interactive driving of hifi dsp, which can make full use of the dsp audio data processing capability. hifi dsp driver needs to rely on icp communication driver and mailbox driver in the kernel isi interface.

2. Compliance with the alsa standard framework which enables dual-channel 48k, 16Bit HDMI audio playback capabilities.
1.2 Audio Drive Workflow

1.2.1 Hifi dsp initialization

Hifi driver initialization process is as follows:

a. Ominit initializes struct hifi_om_s g_om_data; structure, and mainly for the initialization of hifi shared memory structure;
b. IPC driver initialization;
c. Initialization of the Mailbox driver;
d. Ipc terminal registration;
e. Registration of misc devices;
1.2.2 sound card loading process is as follows:

I2S driver registration:
a. I2s driver initial probe
b. I2S dma initialization
c. Register component

Hdmi driver registration:

a. Audio init
b. Register codec

Simple_card Load the sound card:

a. simple_card Probe
b. Resolve dts to find cpu component and codec component
c. Call probe function to cpu component and codec component.
d. Register sound card
1.2.3 Data Transfer

The audio data playback process is as follows:

a. Audio data is sent to hifi misc devices via ioctl
b. Hifi misc device sends data to hifidsp via mailbox
c. Hifi dsp processes the data and places the data in a fixed shared memory address
d. Copy the data processed by hifi dsp to user space
e. Write data to the cpm device
f. Dma driver sends data to hdmi
g. Hdmi sends data to external devices

1.3 Development

1.3.1 DTS Configuration

1. The dts configuration of HIFI driver: arch/arm64/boot/dts/hisilicon/kirin970-hikey970.dts

   hifidsp {
   compatible = "hisilicon,k3hifidsp";
   }

2. Hifi shared memory address dts configuration: arch/arm64/boot/dts/hisilicon/kirin970-hikey970.dts

   hifi-base {
   reg = <0x0 0x8D500000 0x0 0xC000000>;  
   no-map;
   }
   hifi-data {
   reg = <0x0 0x8E300000 0x0 0x5000000>;
   }
3. The dts configuration of I2s2: arch/arm64/boot/dts/hisilicon/kirin970.dtsi
   i2s2: hisi_i2s {
      compatible = "hisilicon,hisi-i2s";
      reg = <0x0 0xe804f800 0x0 0x400>,
             <0x0 0xe804e000 0x0 0x400>;
      pinctrl-names = "default";
      pinctrl-0 = <i2s2_pmx_func &i2s2_cfg_func>;
      dma = <&asp_dmac 18 &asp_dmac 19>;
      dma-names = "rx", "tx";
      #sound-dai-cells = <0>;
   };

4. (4) Simple-audio-card sound card configuration: arch/arm64/boot/dts/hisilicon/kirin970.dtsi
   sound {
      compatible = "simple-audio-card";
      simple-audio-card,name = "hikey-hdmi";
      simple-audio-card,format = "i2s";
      simple-audio-card,bitclock-master = <&sound_master>;
      simple-audio-card,frame-master = <&sound_master>;
      sound_master: simple-audio-card,cpu {
         sound-dai = <&i2s2>;
      };
      simple-audio-card,codec {
         sound-dai = <&adv7533>;
      };
   };

1.3.2 Device Driver Configuration

1. Support hdmi playback function, modify the kernel config:
   arch/arm64/configs/hikey970_defconfig b/arch/arm64/configs/hikey970_defconfig
   CONFIG_HISI_ASP_DMA=y
   CONFIG_SND_I2S_HISI_I2S=y

2. Support hifi dsp driver, configure kernel config:
   CONFIG_HISILICON_PLATFORM=y
   CONFIG_HISILICON_PLATFORM_MAILBOX=y
   CONFIG_HISI_MAILBOX=y
   CONFIG_HISI_RPROC=y
   CONFIG_HIFI_DSP_ONE_TRACK=y
   CONFIG_HIFI_MAILBOX=y
CONFIG_HIFI_IPC=y
CONFIG_HIFI_IPC_3660=y
CONFIG_HIKEY970_HIFI=y