Rockchip RKIPC Application Developer Guide

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Rockchip Electronics Co., Ltd.

No.18 Building, A District, No.89, software Boulevard Fuzhou, Fujian,PRC

Website: www.rock-chips.com

Customer service Tel: +86-4007-700-590

Customer service Fax: +86-591-83951833

Customer service e-Mail: fae@rock-chips.com

Preface

Overview

This document provides instructions for RKIPC application development.

Product Version

Chipset	Kernel Version
RV1126/RV1109	Linux 4.19
RK3588	Linux 5.10/Linux 6.1
RV1103/RV1106/RV1103B	Linux 5.10
RK3576	Linux 6.1

Intended Audience

This document (this guide) is mainly intended for:

Technical support engineers

Software development engineers

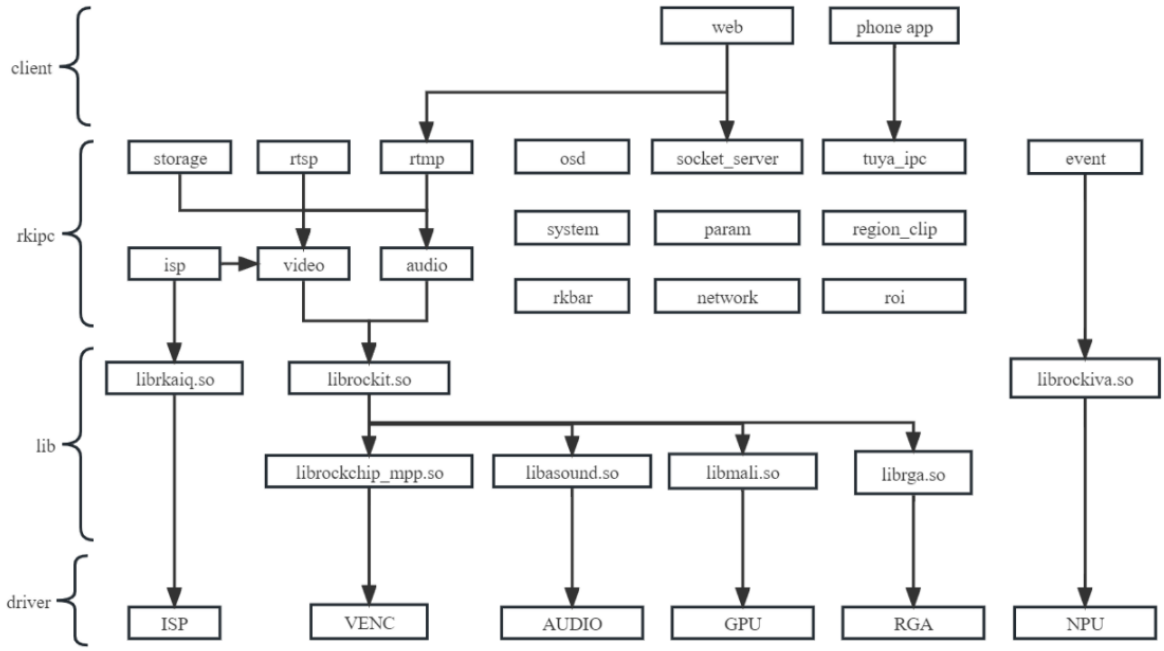
Revision History

Version	Author	Date	Change Description
V0.1.0	Fenrir Lin	2021-09-23	Initial version
V0.2.0	Fenrir Lin	2021-10-23	Add module API introduction
V0.3.0	Fenrir Lin	2021-11-12	Added a description of the media stream block diagram
V0.4.0	Fenrir Lin	2022-01-14	Add isp module API introduction
V0.5.0	Fenrir Lin	2022-01-26	Update code structure and product type
V0.6.0	Fenrir Lin	2022-02-21	Update RV1106 information
V0.7.0	Fenrir Lin	2022-05-05	Update RV1106 battery class IPC block diagram
V0.8.0	Fenrir Lin	2022-05-11	Add ini parameter description
V0.9.0	Fenrir Lin	2022-05-16	Modify RV1106 IPC block diagram
V1.0.0	Fenrir Lin	2022-05-19	Debug isp related parameters in ini
V1.0.1	CWW	2022-05-20	Update product version information
V1.1.0	Fenrir Lin	2022-07-15	Added avs related parameters in ini
V1.2.0	Fenrir Lin	2022-08-18	Modify the RV1106 IPC block diagram and remove the winding part. Add RV1103 IPC block diagram.
V1.3.0	Fenrir Lin	2022-08-31	Modify the RK3588 Multi-IPC block diagram, JPEG is preprocessed by VGS, and VPSS is added after AVS for cover.
V1.4.0	Fenrir Lin	2022-10-10	Modify the IVS module flow diagram of RV1106 IPC and RV1103 IPC,rv1106_battery_ipc is subdivided into rv1106_battery_ipc_client and rv1106_battery_ipc_tuya.
V1.5.0	Fenrir Lin	2022-10-25	Modify the ini module parameter description, and add the audio and video module API introduction.
V1.6.0	Fenrir Lin	2022-12-02	Added RV1106 Dual-IPC block diagram.
V1.6.1	Fenrir Lin	2023-02-18	Modify the RV1126 IPC block diagram.
V1.6.2	Fenrir Lin	2023-03-08	Modify the RV1106 Dual IPC block diagram.
V1.6.3	Ruby Zhang	2023-08-22	Update the format of the document.
V1.6.4	Fenrir Lin	2023-09-13	Modify the RV1126 IPC Rkmedia block diagram. and add the RV1126 Dual-IPC block diagram.
V1.6.5	Yu Zheng	2023-09-26	Added RV1126 AIISP block diagram.
V1.6.6	Fenrir Lin	2023-11-08	Added RV1106 AIISP block diagram.
V1.6.7	Fenrir Lin	2024-05-21	Added RK3576 IPC and RK3576 Multi-IPC block diagram.
V1.6.8	Fenrir Lin	2024-07-18	Supplement the relevant explanations for RV1103B.

Version	Author	Date	Change Description
V1.6.9	Fenrir Lin	2024-0829	Modify the RV1106 Dual-IPC block diagram.

Contents

1. Overall Framework

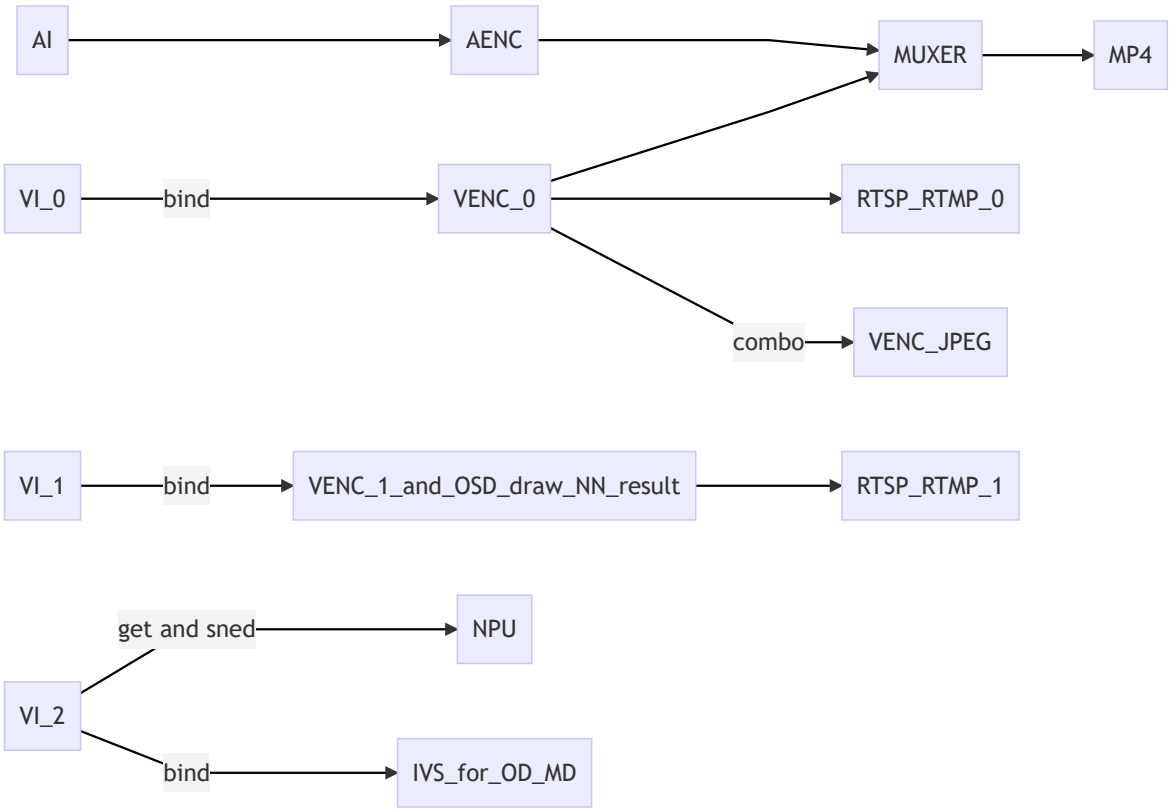


2. Types of Product

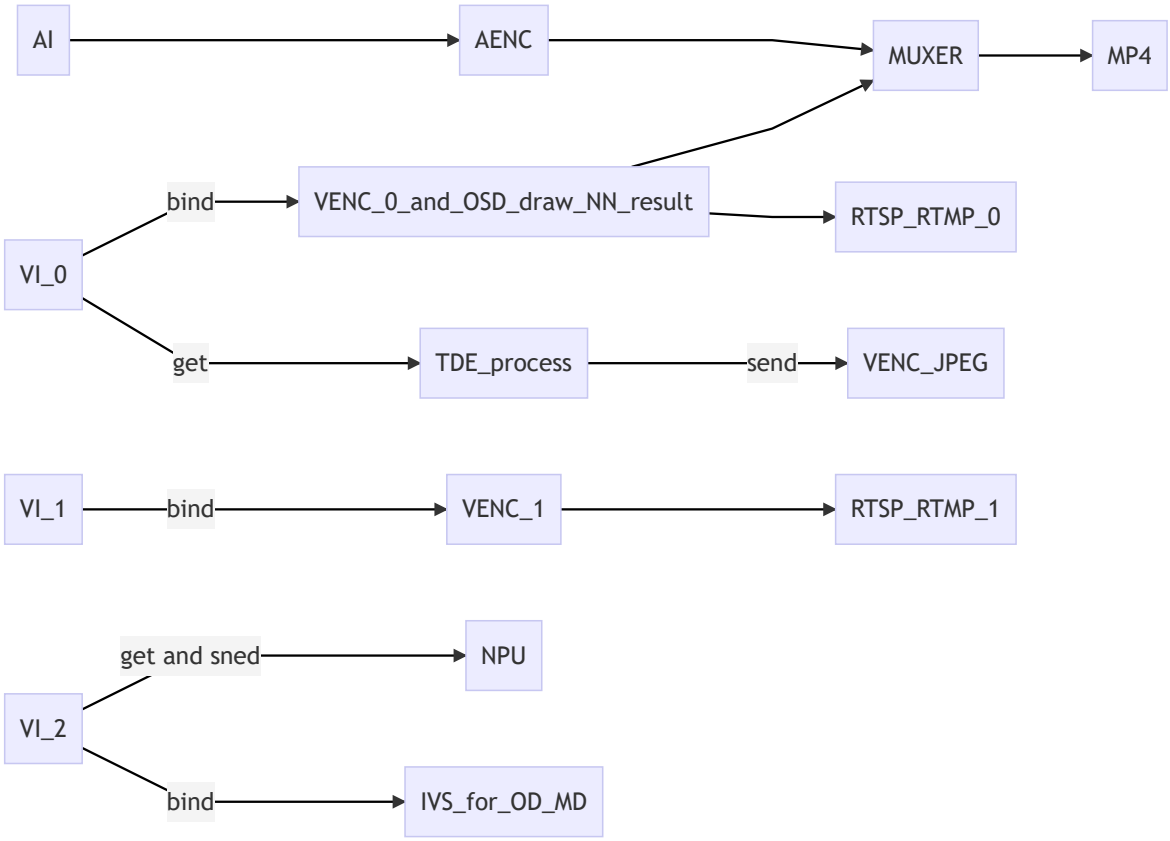
Source Directory	External Dependencies	Functionality
rv1103_ipc	rockit, rkaiq	IPC product for RV1103/RV1103B platform, supports web and rtsp/rtmp preview, dynamic parameter modification, and wrapping is enabled by default.
rv1106_ipc	rockit, rkaiq	IPC product for RV1106/RV1103B platform, supports web and rtsp/rtmp preview, dynamic parameter modification, with wrapping disabled.
rv1106_battery_ipc_client	rockit, rkaiq	Battery-powered product for RV1103/RV1106 platforms, supports web and rtsp/rtmp preview, dynamic parameter modification, serves as a client for quick dual-process booting.
rv1106_battery_ipc_tuya	rockit, rkaiq	Battery-powered product for RV1103/RV1106 platforms, supports preview via Tuya mobile app, with sleep&wake functionality.
rv1106_dual_ipc	rockit, rkaiq	Binocular camera stitching product for RV1103/RV1106/RV1103B platforms, supports web and rtsp/rtmp preview, dynamic parameter modification.
rv1106_aiisp	rockit、rkaiq	IPC product for RV1103/RV1106/RV1103B platforms,based on aiisp, supports web and rtsp/rtmp preview, dynamic parameter modification.
rk3588_ipc	rockit, rkaiq	Single camera IPC product for the RK3588 platform, supports web and rtsp/rtmp preview, dynamic parameter modification.
rk3588_muliti_ipc	rockit, rkaiq	Multi cameras IPC product for RK3588 platform, supports web and rtsp/rtmp preview, dynamic parameter modification.
rv1126_ipc_rkmedia	rockit, rkaiq	IPC product for RV1126/RV1109 platforms, based on rkmedia, supports web and rtsp/rtmp preview, dynamic parameter modification.
rv1126_ipc_rockit	easymedia, rkaiq	IPC product for RV1126/RV1109 platforms,based on rockit, supports web and rtsp/rtmp preview, dynamic parameter modification.
rv1126_battery_ipc	rockit, rkaiq	Battery-powered product for RV1126/RV1109 platforms, supports preview via Tuya mobile app, with sleep&wake functionality.
rv1126_dual_ipc	rockit, rkaiq	Binocular camera stitching product for RV1126/RV1109 platforms, supports web and rtsp/rtmp preview, dynamic parameter modification.
rv1126_snapshot	easymedia, rkaiq	Snapshot-type product for RV1126/RV1109 platforms, supports offline frames, local image/video capture, screen display.

Source Directory	External Dependencies	Functionality
rv1126_aiisp	rockit、rkaiq	IPC product for RV1126/RV1109 platforms,based on aiisp, supports web and rtsp/rtmp preview, dynamic parameter modification.
rk3576_ipc	rockit, rkaiq	Single camera IPC product for the RK3576 platform, supports web and rtsp/rtmp preview, dynamic parameter modification.
rk3576_muliti_ipc	rockit, rkaiq	Multi cameras IPC product for RK3576 platform, supports web and rtsp/rtmp preview, dynamic parameter modification.

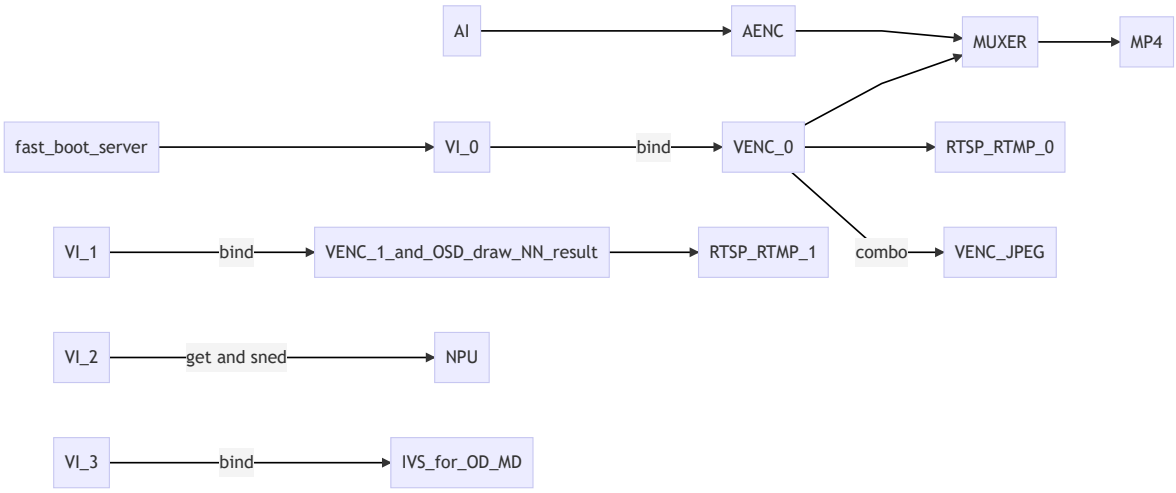
2.1 RV1103 IPC



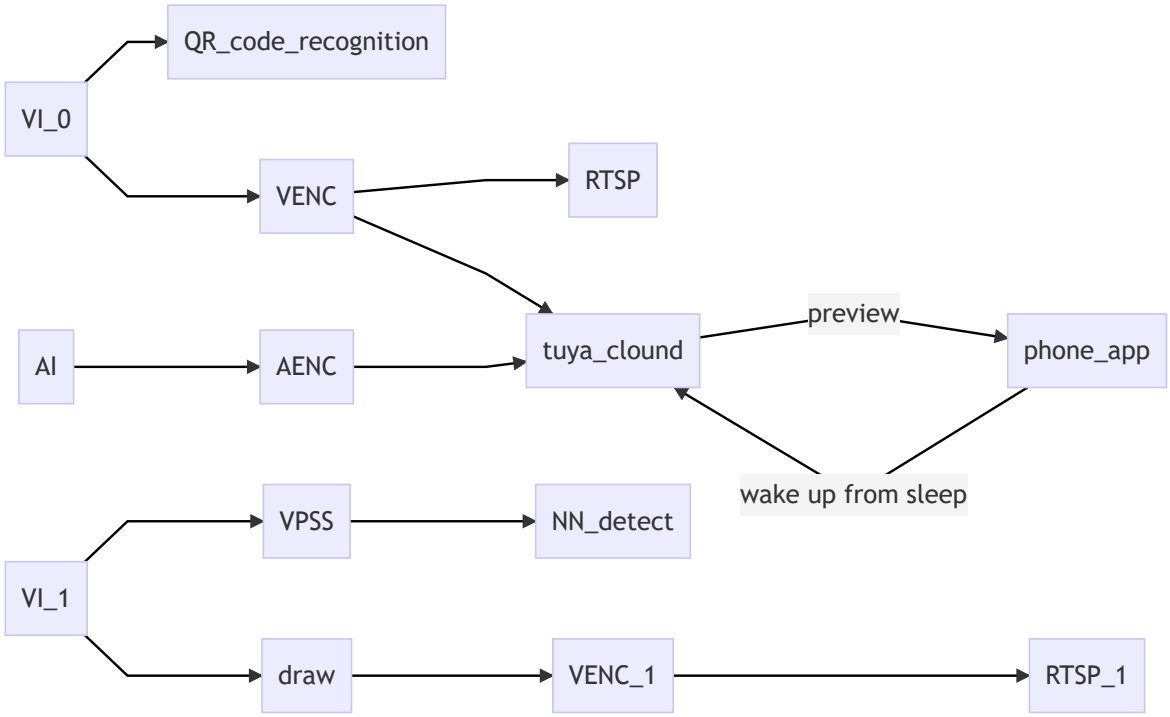
2.2 RV1106 IPC



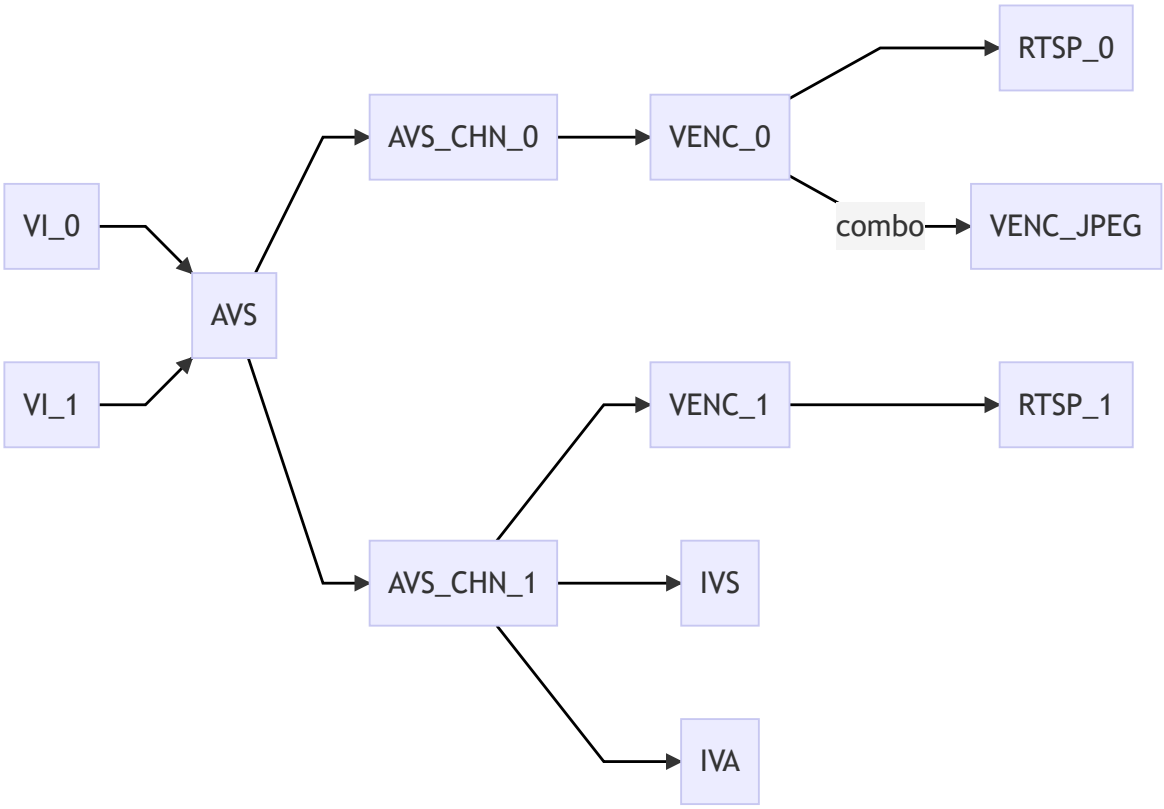
2.3 RV1106 Battery IPC Client



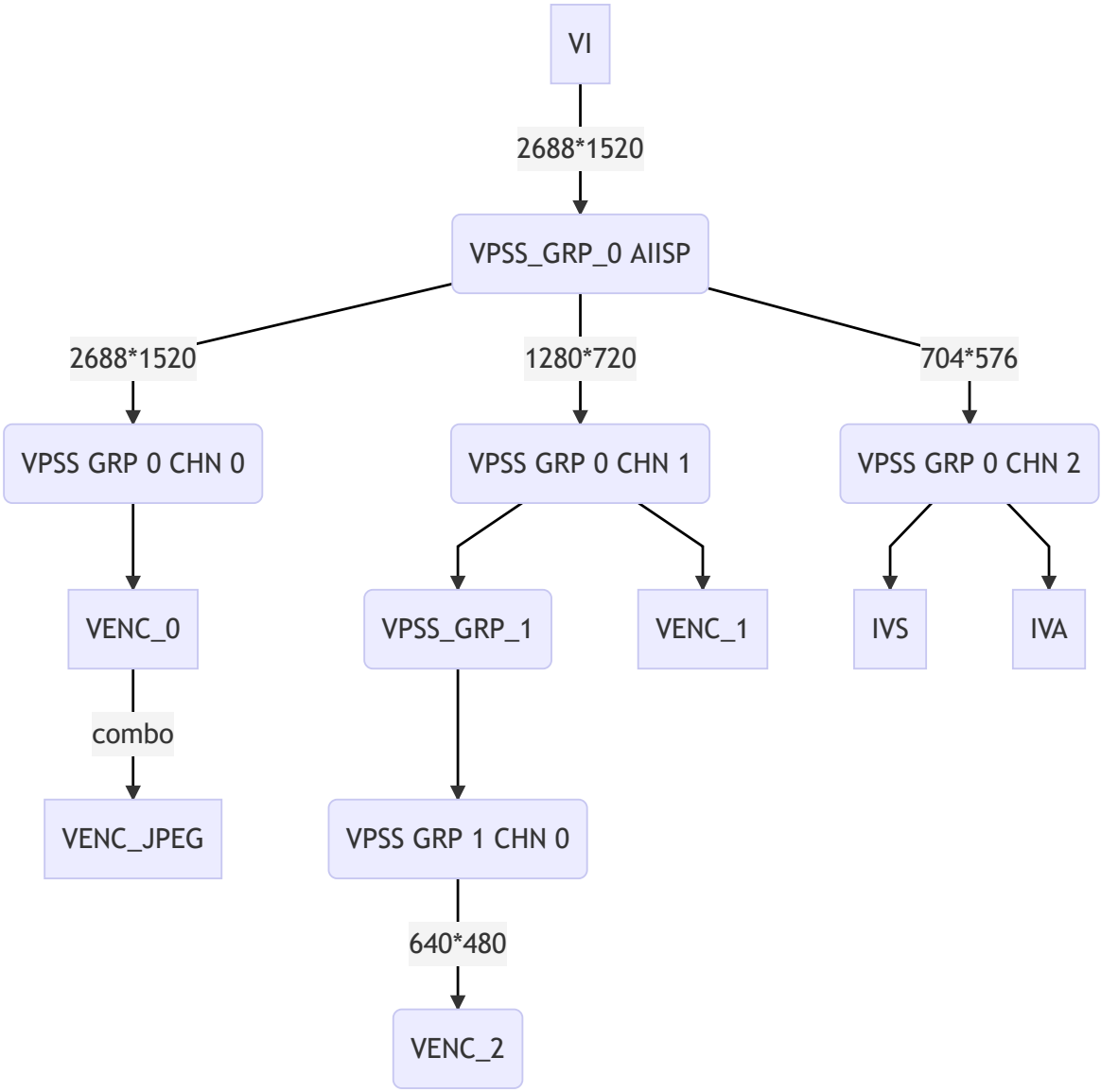
2.4 RV1106 Battery IPC Tuya



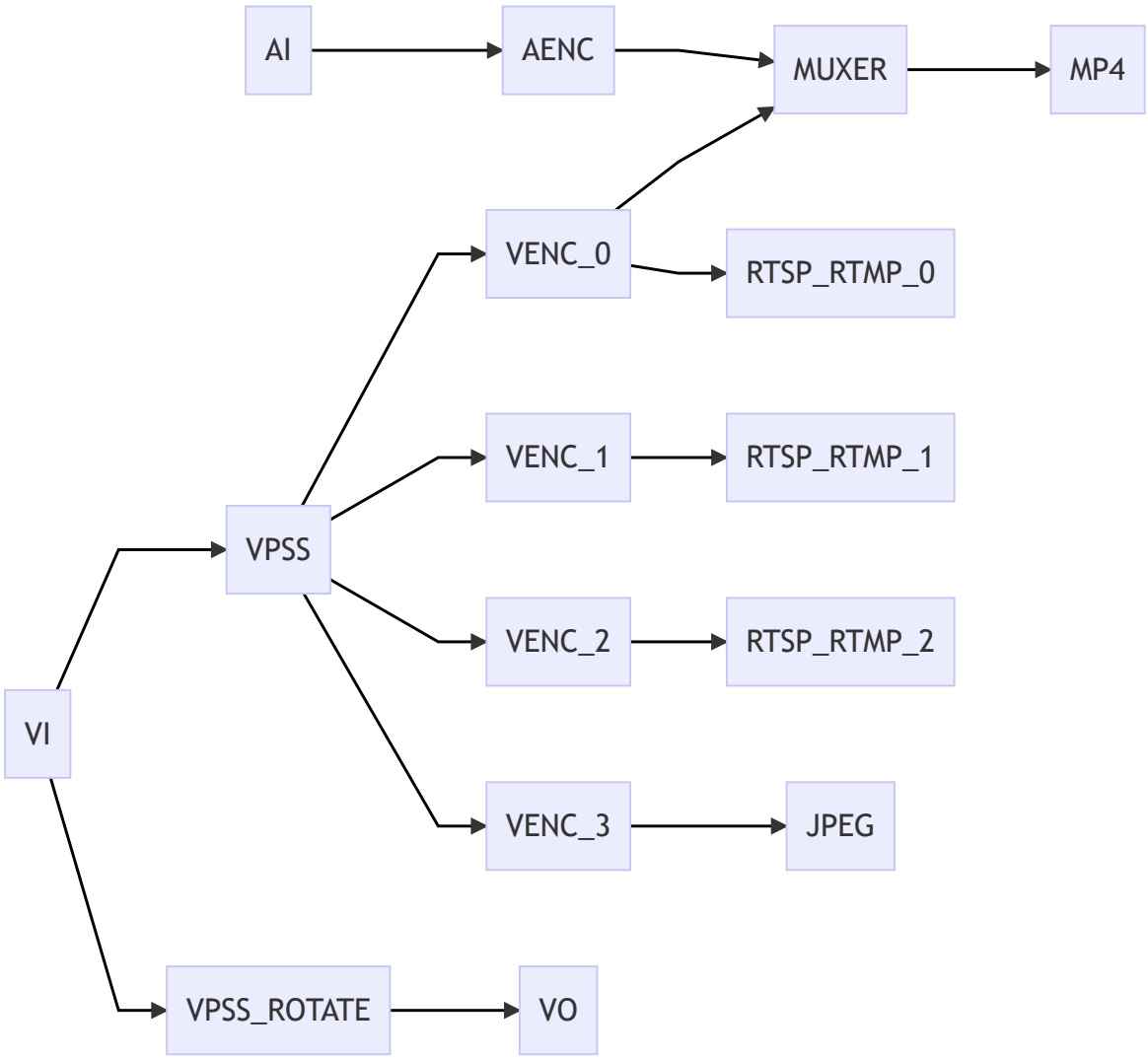
2.5 RV1106 Dual-IPC



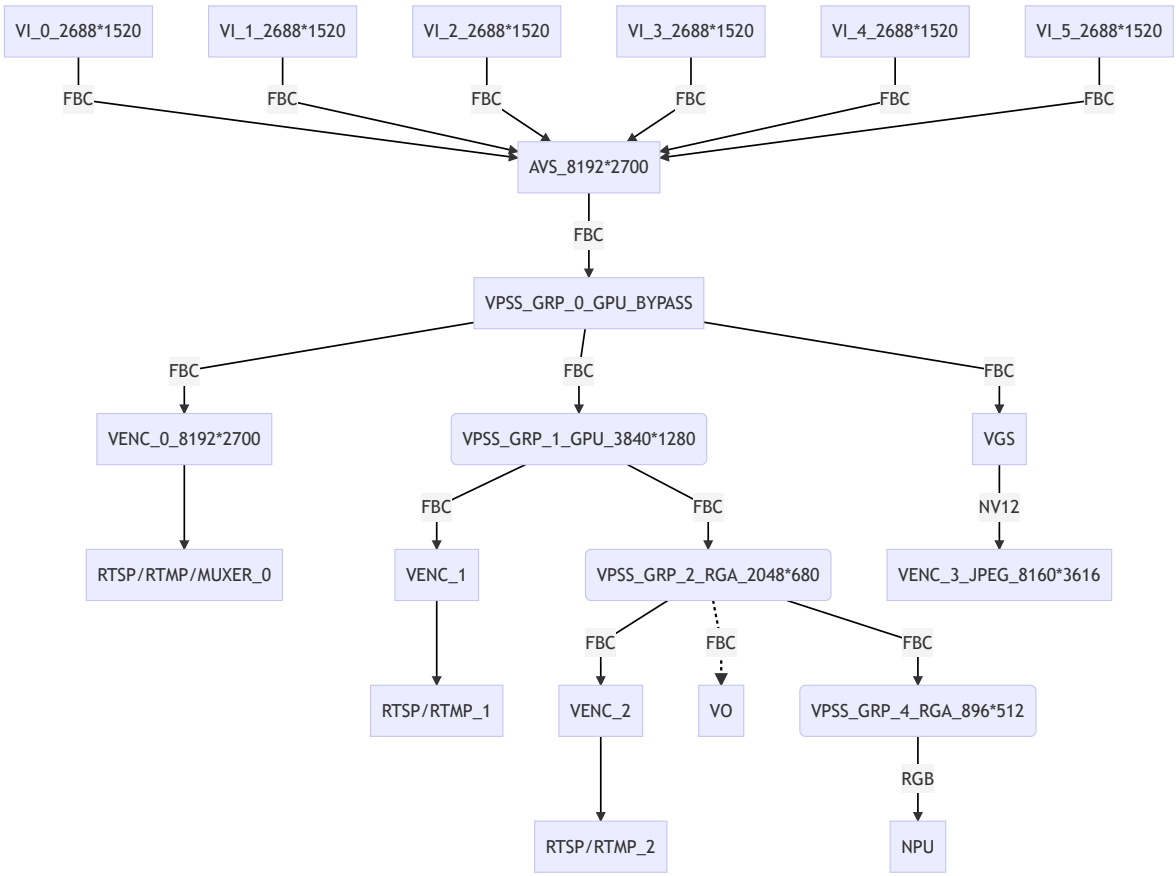
2.6 RV1106 AIISP



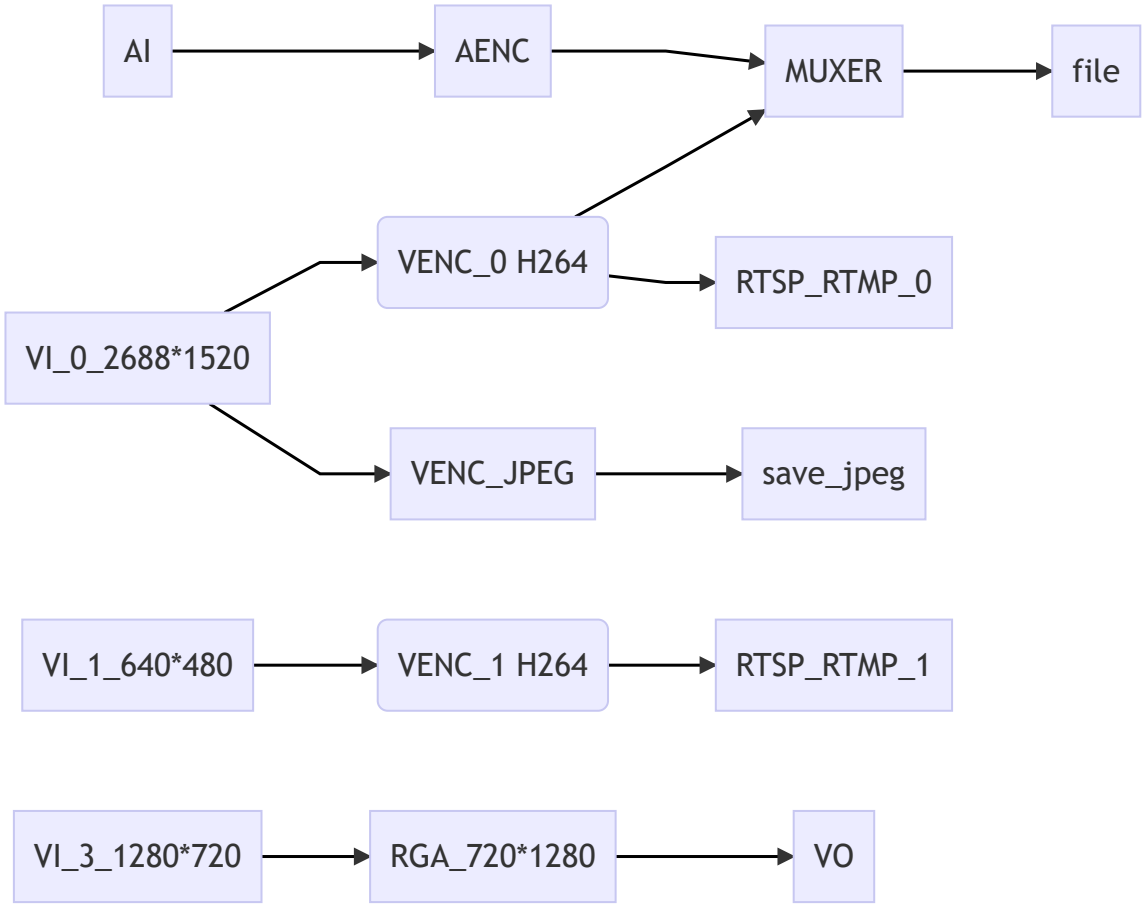
2.7 RK3588 IPC



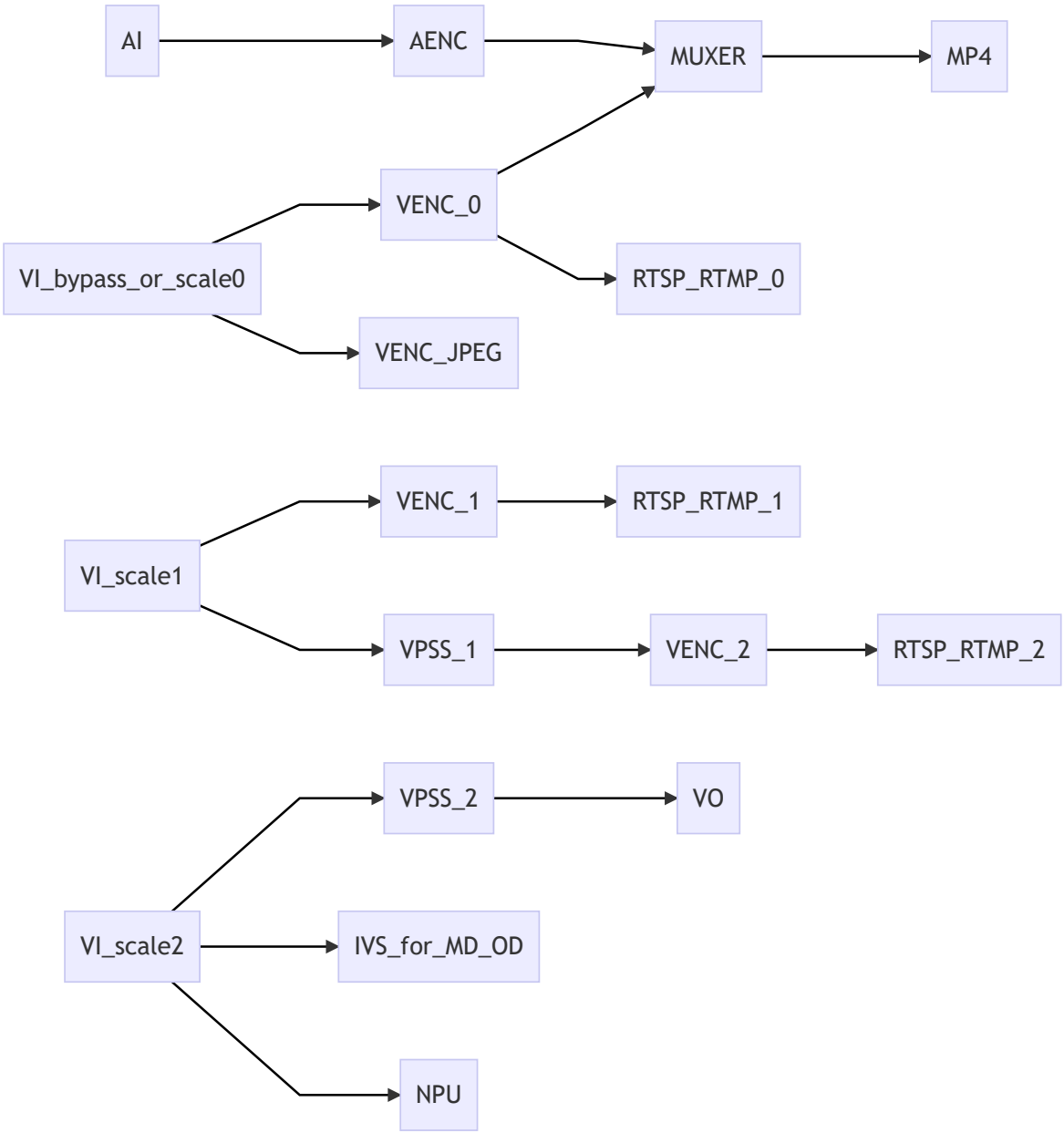
2.8 RK3588 Multi-IPC



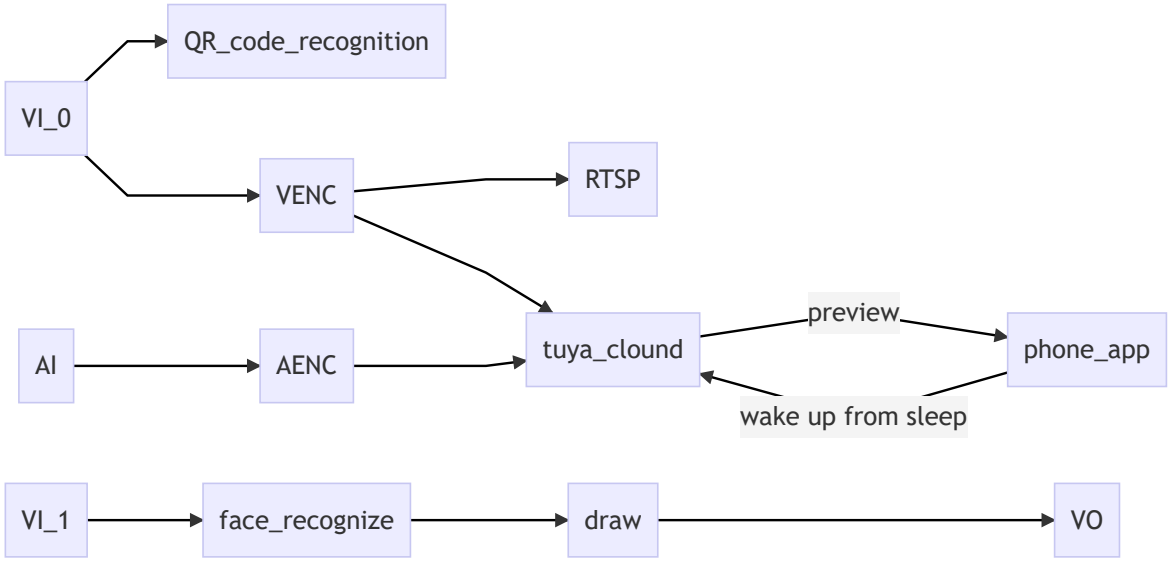
2.9 RV1126 IPC Rkmedia



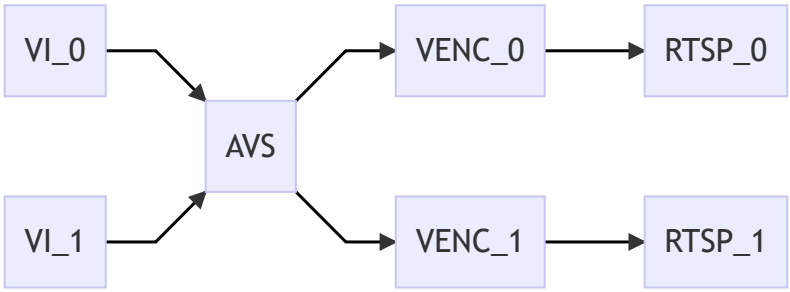
2.10 RV1126 IPC Rockit



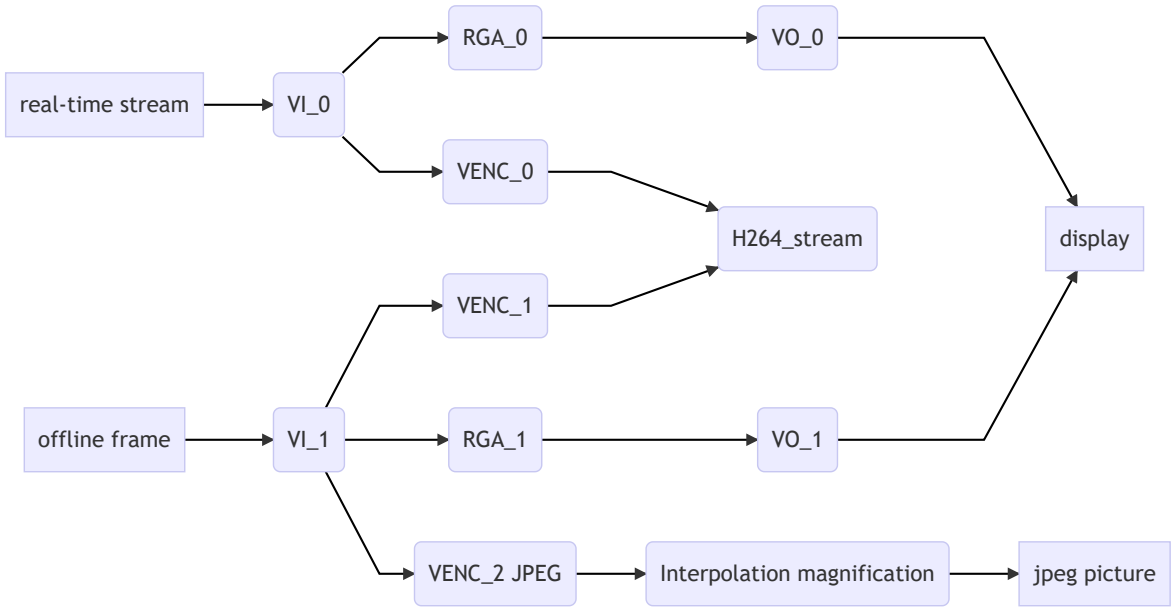
2.11 RV1126 Battery IPC



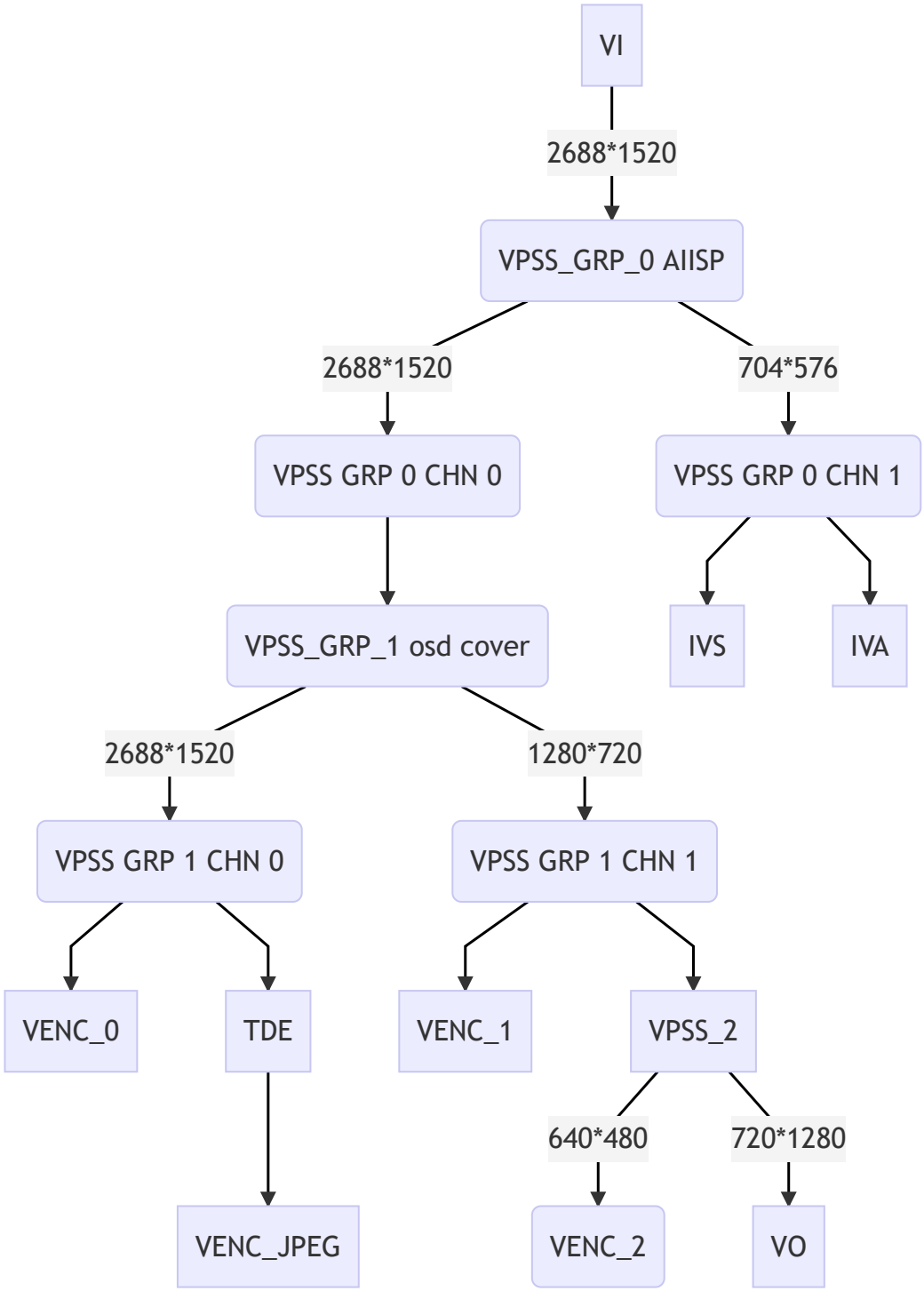
2.12 RV1126 Dual-IPC



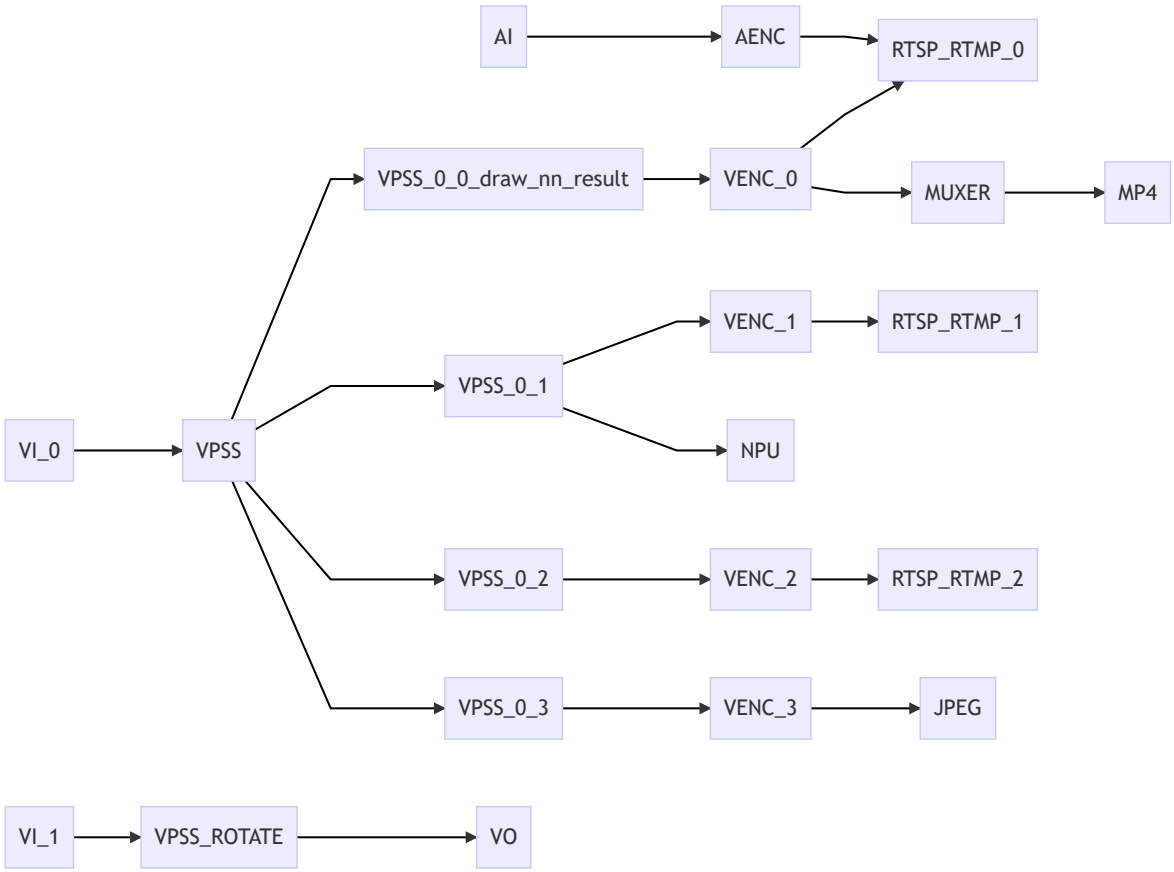
2.13 RV1126 Snapshot



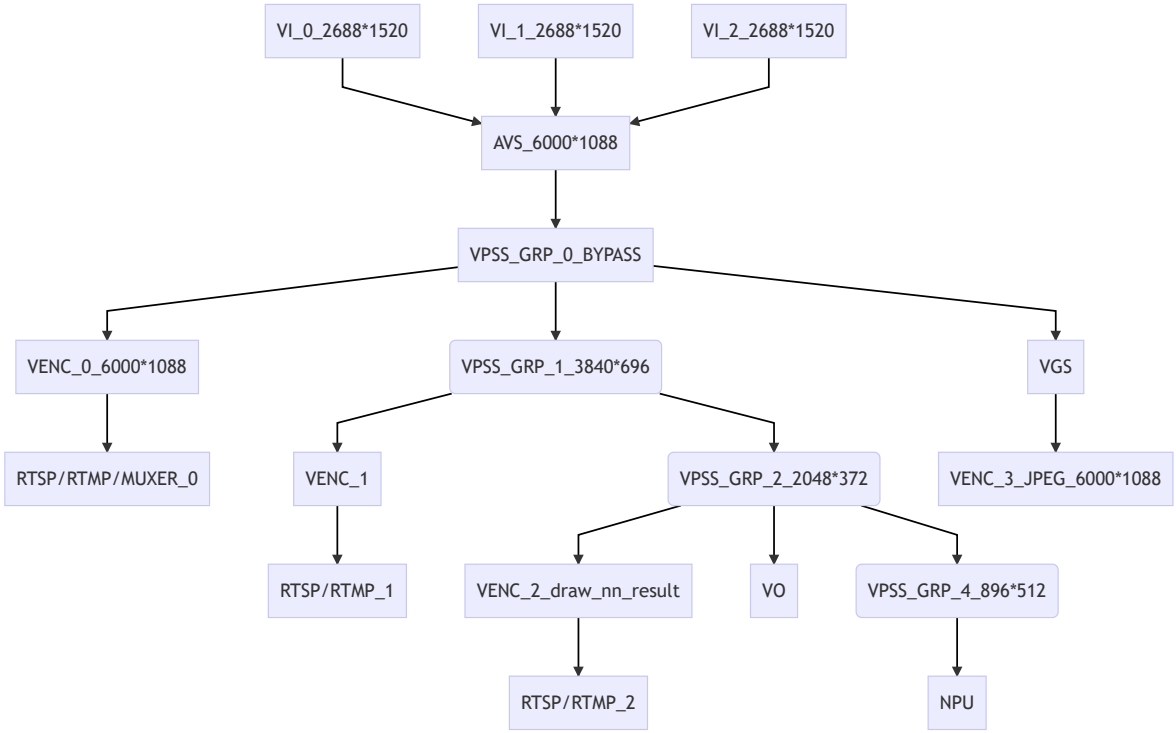
2.14 RV1126 AIISP



2.15 RK3576 IPC



2.16 RK3576 Multi-IPC



3. Code Structure

```
├── CMakeLists.txt
├── common # Common Modules
│   ├── audio # Audio business logic
│   ├── common.h # General utility functions
│   ├── event # Event handling modules
│   ├── isp # Image processing modules
│   ├── log.h # Logging management
│   ├── network # Network modules
│   ├── osd # OSD modules
│   │   ├── image.bmp # Logo image
│   │   └── simsun_en.ttf # Font library
│   ├── param # Parameter management modules
```

```
│   ├── region_clip # Region clip module
│   ├── rockiva # Boundary algorithm module, face and body recognition
│   ├── roi # Region of interest module
│   ├── rtmp # RTMP streaming module
│   ├── rtsp # RTSP streaming module
│   ├── socket_server # Socket server
│   ├── storage # Storage modules
│   └── system # System management modules
│   └── tuya_ipc # Tuya IPC module
├── format.sh # Formatting script
├── lib # Prebuilt libraries of different toolchains, for 32/64-bit versions
│   ├── aarch64-rockchip1031-linux-gnu
│   └── arm-rockchip830-linux-gnueabihf
│   └── arm-rockchip830-linux-uclibcgnueabihf
├── LICENSE # License statement
└── src
    ├── rk3576_ipc
    ├── rk3576_multi_ipc
    ├── rk3588_ipc
    │   ├── CMakeLists.txt
    │   ├── main.c
    │   ├── rkipc.ini # Parameter file
    │   ├── RkLunch.sh # Initialization script
    │   ├── RkLunch-stop.sh # Anti initialization script
    │   └── video # Video business logic
    │       ├── video.c
    │       └── video.h
    ├── rk3588_multi_ipc
    ├── rv1103_ipc
    ├── rv1106_aiisp_ipc
    ├── rv1106_battery_ipc_client
    ├── rv1106_battery_ipc_tuya
    ├── rv1106_dual_ipc
    ├── rv1106_ipc
    ├── rv1106_v4l2_drm
    ├── rv1106_wakeup_ipc
    ├── rv1126_aiisp_ipc
    ├── rv1126_battery_ipc
    ├── rv1126_dual_ipc
    ├── rv1126_ipc_rkmedia
    ├── rv1126_ipc_rockit
    └── rv1126_snapshot
```

4. Development Rules

0. **Pure C Code Implementation**.
1. **Modular Design**: Keep the `main` function concise, calling the `init` and `deinit` functions of various modules. Modules manage their own functionality, and differentiated parts are implemented through registered callback functions.
2. **Use iniparser to manage parameters**: Avoid complex packages; modules decide when and how to read/write parameters in the ini file.
3. **Use common/log.h to output log**.

4. **Maximize Reusability**: Whenever possible, place reusable code in the `common` directory. If platform differences and business logic prevent reusability, each `src` directory should have its own copy to avoid excessive platform-specific macro checks.
5. **Prioritize Source Code Compilation**: First use source code compilation, then static libraries, and finally dynamic libraries.

5. New Parameter Development Process

Web Front-end → Web Back-end → RKIPC → Lower-level Modules → Parameter Saving

Taking hue as an example, the front-end has been basically implemented and does not need to be modified. In the `app/ipcweb-backend/src/image_api.cpp` of the web back-end, a JSON string like "iHue":50 will be received.

Next, use the pre-existing functions in `app/ipcweb-backend/src/socket_client` to make a remote call to RKIPC.

In RKIPC, corresponding functions need to be packaged in `app/rkipc/src/server` to apply and save the settings.

It is recommended to add functions in pairs (get/set).

RKIPC is primarily used to package functions for external calls and for initialization.

Here are some examples:

5.1 Adding the hue Field to the ini File

```
[isp.0.adjustment]
hue = 50
```

5.2 Adding set/get Function to ISP Module

```
diff --git a/src/isp/isp.c b/src/isp/isp.c
index e59fdd3..7877ae9 100644
--- a/src/isp/isp.c
+++ b/src/isp/isp.c
@@ -165,6 +165,22 @@ int rk_isp_set_sharpness(int cam_id, int value) {
   return ret;
 }

+int rk_isp_get_hue(int cam_id, int *value) {
+  RK_ISP_CHECK_CAMERA_ID(cam_id);
+  int ret = rk_aiq_uapi_getHue(g_aiq_ctx[cam_id], value);
+  *value = (int)(*value / 2.55);
+
+  return ret;
+}
+
+int rk_isp_set_hue(int cam_id, int value) {
```

```
+  RK_ISP_CHECK_CAMERA_ID(cam_id);
+  int ret = rk_aiq_uapi_setHue(g_aiq_ctx[cam_id], (int)(value * 2.55)); //
value[0,255]
+  rk_param_set_int("isp.0.adjustment:hue", value);
+
+  return ret;
+}
+
 // exposure
 // night_to_day
 // blc
@@ -180,6 +196,7 @@ int rk_isp_set_from_ini(int cam_id) {
   rk_isp_set_brightness(cam_id, iniparser_getint(g_ini_d_,
"isp.0.adjustment:brightness", 50));
   rk_isp_set_saturation(cam_id, iniparser_getint(g_ini_d_,
"isp.0.adjustment:saturation", 50));
   rk_isp_set_sharpness(cam_id, iniparser_getint(g_ini_d_,
"isp.0.adjustment:sharpness", 50));
+  rk_isp_set_hue(cam_id, iniparser_getint(g_ini_d_, "isp.0.adjustment:hue",
50));
   LOG_INFO("end\n");

   return ret;
diff --git a/src/isp/isp.h b/src/isp/isp.h
index e77c9fc..0d3835a 100644
--- a/src/isp/isp.h
+++ b/src/isp/isp.h
@@ -9,4 +9,6 @@ int rk_isp_get_saturation(int cam_id, int *value);
 int rk_isp_set_saturation(int cam_id, int value);
 int rk_isp_get_sharpness(int cam_id, int *value);
 int rk_isp_set_sharpness(int cam_id, int value);
+int rk_isp_get_hue(int cam_id, int *value);
+int rk_isp_set_hue(int cam_id, int value);
 // exposure
```

5.3 Package Socket Functions in the Server Module

```
diff --git a/src/server/server.c b/src/server/server.c
index 6613b90..52692c9 100644
--- a/src/server/server.c
+++ b/src/server/server.c
@@ -236,6 +236,40 @@ int ser_rk_isp_set_sharpness(int fd) {
   return 0;
 }

+int ser_rk_isp_get_hue(int fd) {
+  int err = 0;
+  int cam_id;
+  int value;
+
+  if (sock_read(fd, &cam_id, sizeof(cam_id)) == SOCKERR_CLOSED)
+    return -1;
+  err = rk_isp_get_hue(cam_id, &value);
+  LOG_DEBUG("value is %d\n", value);
+  if (sock_write(fd, &value, sizeof(value)) == SOCKERR_CLOSED)
```

```
+    return -1;
+  if (sock_write(fd, &err, sizeof(int)) == SOCKERR_CLOSED)
+    return -1;
+
+  return 0;
+}
+
+int ser_rk_isp_set_hue(int fd) {
+  int err = 0;
+  int cam_id;
+  int value;
+
+  if (sock_read(fd, &cam_id, sizeof(cam_id)) == SOCKERR_CLOSED)
+    return -1;
+  if (sock_read(fd, &value, sizeof(value)) == SOCKERR_CLOSED)
+    return -1;
+  LOG_DEBUG("value is %d\n", value);
+  err = rk_isp_set_hue(cam_id, value);
+  if (sock_write(fd, &err, sizeof(int)) == SOCKERR_CLOSED)
+    return -1;
+
+  return 0;
+}
+
 static const struct FunMap map[] = {
     {(char *)"rk_isp_set", &ser_rk_isp_set},
     {(char *)"rk_video_set", &ser_rk_video_set},
@@ -247,7 +281,9 @@ static const struct FunMap map[] = {
     {(char *)"rk_isp_get_saturation", &ser_rk_isp_get_saturation},
     {(char *)"rk_isp_set_saturation", &ser_rk_isp_set_saturation},
     {(char *)"rk_isp_get_sharpness", &ser_rk_isp_get_sharpness},
-    {(char *)"rk_isp_set_sharpness", &ser_rk_isp_set_sharpness}
+    {(char *)"rk_isp_set_sharpness", &ser_rk_isp_set_sharpness},
+    {(char *)"rk_isp_get_hue", &ser_rk_isp_get_hue},
+    {(char *)"rk_isp_set_hue", &ser_rk_isp_set_hue}
 };

 static void *rec_thread(void *arg) {
```

5.4 Add Related Judgments to the Web Back-end

The ipcweb-backend is mainly used to judge the data incoming from the web front end, and then Get/Set data, the modification is as follows:

```
diff --git a/src/image_api.cpp b/src/image_api.cpp
index 475e17d..edac2de 100644
--- a/src/image_api.cpp
+++ b/src/image_api.cpp
@@ -20,15 +20,17 @@ nlohmann::json image_specific_resource_get(std::string
string) {
       nlohmann::json::object(); /* one of all the same resources */
   minilog_debug("%s: string is %s\n", __func__, string.c_str());
   if (!string.compare(PATH_IMAGE_ADJUSTMENT)) {
-    int brightness, contrast, saturation, sharpness;
+    int brightness, contrast, saturation, sharpness, hue;
```

```
      rk_isp_get_brightness(0, &brightness);
      rk_isp_get_contrast(0, &contrast);
      rk_isp_get_saturation(0, &saturation);
      rk_isp_get_sharpness(0, &sharpness);
+     rk_isp_get_hue(0, &hue);
      specific_resource.emplace("iBrightness", brightness);
      specific_resource.emplace("iContrast", contrast);
      specific_resource.emplace("iSaturation", saturation);
      specific_resource.emplace("iSharpness", sharpness);
+     specific_resource.emplace("iHue", hue);
    } else if (!string.compare(PATH_IMAGE_EXPOSURE)) {

    } else if (!string.compare(PATH_IMAGE_NIGHT_TO_DAY)) {
@@ -84,6 +86,10 @@ void image_specific_resource_set(std::string string,
nlohmann::json data) {
        value = atoi(data.at("iSharpness").dump().c_str());
        rk_isp_set_sharpness(0, value);
      }
+     if (data.dump().find("iHue") != data.dump().npos) {
+       value = atoi(data.at("iHue").dump().c_str());
+       rk_isp_set_hue(0, value);
+     }
    } else if (!string.compare(PATH_IMAGE_EXPOSURE)) {

    } else if (!string.compare(PATH_IMAGE_NIGHT_TO_DAY)) {
diff --git a/src/socket_client/client.cpp b/src/socket_client/client.cpp
index 448e847..7f84b4f 100644
--- a/src/socket_client/client.cpp
+++ b/src/socket_client/client.cpp
@@ -182,4 +182,36 @@ int rk_isp_set_sharpness(int cam_id, int value) {
    cli_end(fd);

    return ret;
 }
+
+int rk_isp_get_hue(int cam_id, int *value) {
+  int fd;
+  int ret = 0;
+
+  fd = cli_begin((char *)__func__);
+  /* Transmission parameters */
+  sock_write(fd, &cam_id, sizeof(cam_id));
+  sock_read(fd, value, sizeof(value));
+
+  sock_read(fd, &ret, sizeof(ret));
+  /* End transmission parameters */
+  cli_end(fd);
+
+  return ret;
+}
+
+int rk_isp_set_hue(int cam_id, int value) {
+  int fd;
+  int ret = 0;
+
+  fd = cli_begin((char *)__func__);
+  /* Transmission parameters */
+  sock_write(fd, &cam_id, sizeof(cam_id));
```

```
+  sock_write(fd, &value, sizeof(value));
+
+  sock_read(fd, &ret, sizeof(ret));
+  /* End transmission parameters */
+  cli_end(fd);
+
+  return ret;
+}
diff --git a/src/socket_client/client.h b/src/socket_client/client.h
index 11fdd1c..0c09913 100644
--- a/src/socket_client/client.h
+++ b/src/socket_client/client.h
@@ -8,4 +8,6 @@ int rk_isp_set_brightness(int cam_id, int value);
 int rk_isp_get_saturation(int cam_id, int *value);
 int rk_isp_set_saturation(int cam_id, int value);
 int rk_isp_get_sharpness(int cam_id, int *value);
 int rk_isp_set_sharpness(int cam_id, int value);
+int rk_isp_get_hue(int cam_id, int *value);
+int rk_isp_set_hue(int cam_id, int value);
\ No newline at end of file
```

5.5 Add Related Judgments to the Web Front End

Modify html and ts files in the web front end , and add option layout and get/set.

The code can refer to the html and ts in app/ipcweb-ng/src/app/config/shared/isp, the main content are as follows:

```
<form class="form" [formGroup]="imageForm">
      <div id=ispGrp role="tablist">
        <div class="card" *ngFor="let cardTitle of cardList">
          <div id="ispGrp1Header" class="card-header"
(click)="onSelectCard(cardTitle)">
            <label>{{ groupNameDict[cardTitle] | translate }}</label>
          </div>
          <div class="card-body card-block form-group" [id]="cardTitle"
[formGroupName]="groupNameDict[cardTitle]">
            <ng-container *ngIf="capDict[cardTitle][layoutKey]">
              <ng-container *ngFor="let layoutItem of capDict[cardTitle]
[layoutKey][cardTitle]">
                <div class="form-row my-1" *ngIf="checkType(capDict[cardTitle]
[pageLayoutKey][layoutItem], 'range')">
                  <label class="col-3">{{ transferControlName(layoutItem) |
translate }}</label>
                  <input class="col-6 custom-range"
[formControlName]="layoutItem" type="range"
(ngModelChange)="onRangeChange($event, cardTitle, layoutItem)"
(mouseup)="onSubmitPart(cardTitle, layoutItem, 'range')"
[min]="getRange(capDict[cardTitle][pageLayoutKey][layoutItem], 'min')"
[max]="getRange(capDict[cardTitle][pageLayoutKey][layoutItem], 'max')"
[step]="getRange(capDict[cardTitle][pageLayoutKey][layoutItem], 'step')">
                  <input class="col-2 form-control"
[formControlName]="layoutItem" type="number"
(ngModelChange)="onRangeChange($event, cardTitle, layoutItem)"
(blur)="onSubmitPart(cardTitle, layoutItem, 'number')" [id]="layoutItem">
```

```
                  <label class="alarm-tip pat1"
*ngIf="imageForm.get(groupNameDict[cardTitle]).get(layoutItem).errors?.min ||
imageForm.get(groupNameDict[cardTitle]).get(layoutItem).errors?.max ||
imageForm.get(groupNameDict[cardTitle]).get(layoutItem).errors?.isNumberJudge">
{{'ranges' | translate}}({{getRange(capDict[cardTitle][pageLayoutKey]
[layoutItem], 'min')}}~{{getRange(capDict[cardTitle][pageLayoutKey][layoutItem],
'max')}})</label>
                </div>
                <div class="form-row my-1" *ngIf="checkType(capDict[cardTitle]
[pageLayoutKey][layoutItem], 'options') && isItemEnable(layoutItem)">
                  <label class="col-3 form-group-text mt-1">{{
transferControlName(layoutItem) | translate }}</label>
                  <select class="custom-select col-md-8"
[formControlName]="layoutItem" (ngModelChange)="updateDynamicCap(cardTitle,
layoutItem, $event)" [id]="layoutItem">
                    <option *ngFor="let opItem of htmlOptionFilter(layoutItem,
capDict[cardTitle][pageLayoutKey][layoutItem]['options'])" [value]="opItem">{{
htmlOptionTransfer(layoutItem, opItem) | translate }}</option>
                  </select>
                </div>
                <div class="form-row my-1" *ngIf="checkType(capDict[cardTitle]
[pageLayoutKey][layoutItem], 'input') && capDict[cardTitle][pageLayoutKey]
[layoutItem]['input']==='time'">
                  <label class="col-3">{{ transferControlName(layoutItem) |
translate }}</label>
                  <input type="time" step=1 [formControlName]="layoutItem"
(blur)="onSubmitPart(cardTitle, layoutItem, 'time')" [id]="layoutItem">
                </div>
              </ng-container>
            </ng-container>
          </div>
        </div>
      </div>
    </form>
```

```
imageForm = this.fb.group({
    id: [''],
    imageAdjustment: this.fb.group({
      iBrightness: [''],
      iContrast: [''],
      iSaturation: [''],
      iSharpness: [''],
      iHue: ['']
    })
});

get imageAdjustment(): FormGroup {
    return this.imageForm.get('imageAdjustment') as FormGroup;
}

submitOne(groupName: string, isReboot: boolean = false, isAppRestart = false) {
    if (!this.isInit || this.lock.checkLock('submitOne')) {
      return;
    }
    this.lock.lock('submitOne');
    this.pfs.formatInt(this.imageForm.value[groupName]);
    const path = this.group2path[groupName];
```

```
    this.cfgService.setImageInterfacePart(this.imageForm.value[groupName], path,
this.imageForm.value['id']).subscribe(
      res => {
        this.resError.analyseRes(res, 'saveFail');
        this.setAlarmTip(res, groupName);
        this.imageForm.get(groupName).patchValue(res);
        if (isReboot) {
          this.tips.setCTPara('restart');
        } else if (isAppRestart) {
          this.tips.setRbTip('appRestart');
        } else {
          this.tips.showSaveSuccess();
        }
        this.lock.unlock('submitOne');
      },
      err => {
        if (isReboot) {
          this.tips.setCTPara('close');
        }
        this.tips.showSaveFail();
        this.lock.unlock('submitOne');
      }
    );
  }
```

6. Module API Introduction

6.1 Network Module

Function Name	Functionality
rk_network_init	Initialize network module
rk_network_deinit	Deinitialize network module
rk_network_ipv4_set	Set IPv4 configuration
rk_network_ipv4_get	Get IPv4 configuration
rk_network_dns_get	Get current wired network DNS
rk_network_dns_set	Set current wired network DNS
rk_network_get_mac	Get device MAC address
rk_network_set_mac	Set device MAC address
rk_network_nicspeed_get	Get NIC speed
rk_network_nicspeed_set	Set NIC speed
rk_network_nicspeed_support_get	Get supported NIC speeds
rk_ethernet_power_set	Turn on/off Ethernet
rk_nic_state_get	Get current NIC state
rk_wifi_power_get	Get current Wi-Fi state
rk_wifi_power_set	Turn on/off Wi-Fi
rk_wifi_scan_wifi	Scan Wi-Fi immediately
rk_wifi_get_list	Get Wi-Fi network list
rk_wifi_connect_with_ssid	Connect to Wi-Fi network with SSID
rk_wifi_forget_with_ssid	Forget Wi-Fi network with SSID

6.2 Packaged Module

Function Name	Functionality
rkmuxer_init	Initialize muxer module
rkmuxer_deinit	Deinitialize muxer module
rkmuxer_write_video_frame	Write video frame
rkmuxer_write_audio_frame	Write audio frame

6.3 Storage Module

Function Name	Functionality
rk_storage_init	Initialize storage module
rk_storage_deinit	Deinitialize storage module
rk_storage_write_video_frame	Write video frame
rk_storage_write_audio_frame	Write audio frame
rk_storage_record_start	Start recording
rk_storage_record_stop	Stop recording
rk_storage_record_status_get	Get recording status

6.4 OSD Module

Due to differences in OSD implementation between rkmedia and rockit libraries, and to abstract the OSD module's business logic and decouple it from the video module, a callback registration approach is used.

By registering relevant functions, different implementations can be used while maintaining consistent upper-level logic.

Function Name	Functionality
rk_osd_cover_create_callback_register	Register callback for creating a cover
rk_osd_cover_destroy_callback_register	Register callback for destroying a cover
rk_osd_bmp_create_callback_register	Register callback for creating a BMP
rk_osd_bmp_destroy_callback_register	Register callback for destroying a BMP
rk_osd_bmp_change_callback_register	Register callback for changing a BMP
rk_osd_init	Initialize OSD module
rk_osd_deinit	Deinitialize OSD module
rk_osd_restart	Restart OSD module
fill_image	Fill image
fill_text	Generate and fill text image
generate_date_time	Generate wide character timestamp
rk_osd_get_font_size	Get font size
rk_osd_set_font_size	Set font size
rk_osd_get_font_color	Get font color
rk_osd_set_font_color	Set font color
rk_osd_get_font_path	Get font file path
rk_osd_set_font_path	Set font file path
rk_osd_get_enabled	Get enable state
rk_osd_set_enabled	Set enable state
rk_osd_get_position_x	Get X position
rk_osd_set_position_x	Set X position
rk_osd_get_position_y	Get Y position
rk_osd_set_position_y	Set Y position
rk_osd_get_height	Get height
rk_osd_set_height	Set height
rk_osd_get_width	Get width
rk_osd_set_width	Set width
rk_osd_get_display_text	Get display text
rk_osd_set_display_text	Set display text
rk_osd_get_image_path	Get image file path

Function Name	Functionality
rk_osd_set_image_path	Set image file path

6.5 System Module

Currently, the initial INI file is /usr/share/rkipc.ini by default. When there is no rkipc.ini in /userdata, the booting script will copy it there.

During a factory reset, /usr/share/rkipc.ini will be copied to /userdata/rkipc.ini.

Function Name	Functionality
rk_system_init	Initialize system module
rk_system_deinit	Deinitialize system module
rk_system_reboot	Reboot
rk_system_factory_reset	Factory reset
rk_system_export_log	Export logs
rk_system_export_db	Export configuration files
rk_system_import_db	Import configuration files
rk_system_upgrade	System upgrade
rk_system_get_user_num	Get user count
rk_system_set_user_num	Set user count
rk_system_get_user_level	Get user permission level
rk_system_set_user_level	Set user permission level
rk_system_get_user_name	Get username
rk_system_set_user_name	Set username
rk_system_get_password	Get password (encrypted)
rk_system_set_password	Set password (encrypted)
rk_system_add_user	Add user
rk_system_del_user	Delete user

6.6 Event Module

Currently only supported for rv1126_ipc_rkmedia.

Function Name	Functionality
rk_event_init	Initialize event module
rk_event_deinit	Deinitialize event module
rk_event_ri_get_enabled	Get region intrusion enable status
rk_event_ri_set_enabled	Set region intrusion enable status
rk_event_ri_get_position_x	Get region intrusion X coordinate
rk_event_ri_set_position_x	Set region intrusion X coordinate
rk_event_ri_get_position_y	Get region intrusion Y coordinate
rk_event_ri_set_position_y	Set region intrusion Y coordinate
rk_event_ri_get_width	Get region intrusion width
rk_event_ri_set_width	Set region intrusion width
rk_event_ri_get_height	Get region intrusion height
rk_event_ri_set_height	Set region intrusion height
rk_event_ri_get_proportion	Get region intrusion proportion
rk_event_ri_set_proportion	Set region intrusion proportion
rk_event_ri_get_sensitivity_level	Get region intrusion sensitivity level
rk_event_ri_set_sensitivity_level	Set region intrusion sensitivity level
rk_event_ri_get_time_threshold	Get region intrusion time threshold
rk_event_ri_set_time_threshold	Set region intrusion time threshold

6.7 RTMP Streaming Module

Function Name	Functionality
rk_rtmp_init	Initialize RTMP module
rk_rtmp_deinit	Deinitialize RTMP module
rk_rtmp_write_video_frame	Write video frame
rk_rtmp_write_audio_frame	Write audio frame

6.8 RTSP Streaming Module

Function Name	Functionality
create_rtsp_demo	Create handle
rtsp_new_session	Create session based on URL
rtsp_set_video	Set video stream format
rtsp_set_audio	Set audio stream format
rtsp_sync_video_ts	Synchronize video timestamps
rtsp_sync_audio_ts	Synchronize audio timestamps
rtsp_del_session	Delete session
rtsp_del_demo	Delete handle
rtsp_tx_video	Transmit video frame
rtsp_tx_audio	Transmit audio frame
rtsp_do_event	Execute operation

6.9 ISP Module

Function Name	Functionality
rk_isp_init	Initialize single camera
rk_isp_deinit	Deinitialize single camera
rk_isp_group_init	Initialize multi-camera
rk_isp_group_deinit	Deinitialize multi-camera
rk_isp_set_frame_rate	Set frame rate
rk_isp_get_contrast	Get contrast
rk_isp_set_contrast	Set contrast
rk_isp_get_brightness	Get brightness
rk_isp_set_brightness	Set brightness
rk_isp_get_saturation	Get saturation
rk_isp_set_saturation	Set saturation
rk_isp_get_sharpness	Get sharpness
rk_isp_set_sharpness	Set sharpness
rk_isp_get_hue	Get hue
rk_isp_set_hue	Set hue
rk_isp_get_exposure_mode	Get exposure mode
rk_isp_set_exposure_mode	Set exposure mode
rk_isp_get_gain_mode	Get gain mode
rk_isp_set_gain_mode	Set gain mode
rk_isp_get_exposure_time	Get exposure time
rk_isp_set_exposure_time	Set exposure time
rk_isp_get_exposure_gain	Get exposure gain
rk_isp_set_exposure_gain	Set exposure gain
rk_isp_get_hdr	Get HDR mode
rk_isp_set_hdr	Set HDR mode
rk_isp_get_blc_region	Get backlight mode
rk_isp_set_blc_region	Set backlight mode
rk_isp_get_hlc	Get highlight suppression mode
rk_isp_set_hlc	Set highlight suppression mode
rk_isp_get_hdr_level	Get HDR level

Function Name	Functionality
rk_isp_set_hdr_level	Set HDR level
rk_isp_get_blc_strength	Get backlight strength
rk_isp_set_blc_strength	Set backlight strength
rk_isp_get_hlc_level	Get highlight suppression level
rk_isp_set_hlc_level	Set highlight suppression level
rk_isp_get_dark_boost_level	Get dark area enhancement level
rk_isp_set_dark_boost_level	Set dark area enhancement level
rk_isp_get_white_blance_style	Get white balance mode
rk_isp_set_white_blance_style	Set white balance mode
rk_isp_get_white_blance_red	Get white balance R gain
rk_isp_set_white_blance_red	Set white balance R gain
rk_isp_get_white_blance_green	Get white balance G gain
rk_isp_set_white_blance_green	Set white balance G gain
rk_isp_get_white_blance_blue	Get white balance B gain
rk_isp_set_white_blance_blue	Set white balance B gain
rk_isp_get_noise_reduce_mode	Get noise reduction mode
rk_isp_set_noise_reduce_mode	Set noise reduction mode
rk_isp_get_dehaze	Get dehaze mode
rk_isp_set_dehaze	Set dehaze mode
rk_isp_get_gray_scale_mode	Get grayscale range
rk_isp_set_gray_scale_mode	Set grayscale range
rk_isp_get_distortion_correction	Get distortion correction mode
rk_isp_set_distortion_correction	Set distortion correction mode
rk_isp_get_spatial_denoise_level	Get spatial denoise level
rk_isp_set_spatial_denoise_level	Set spatial denoise level
rk_isp_get_temporal_denoise_level	Get temporal denoise level
rk_isp_set_temporal_denoise_level	Set temporal denoise level
rk_isp_get_dehaze_level	Get dehaze level
rk_isp_set_dehaze_level	Set dehaze level
rk_isp_get_ldch_level	Get LDCH level

Function Name	Functionality
rk_isp_set_ldch_level	Set LDCH level
rk_isp_get_power_line_frequency_mode	Get power line frequency mode
rk_isp_set_power_line_frequency_mode	Set power line frequency mode
rk_isp_get_image_flip	Get image flip
rk_isp_set_image_flip	Set image flip
rk_isp_get_af_mode	Get auto-focus mode
rk_isp_set_af_mode	Set auto-focus mode
rk_isp_get_zoom_level	Get zoom level
rk_isp_set_zoom_level	Set zoom level
rk_isp_af_zoom_in	Zoom in
rk_isp_af_zoom_out	Zoom out
rk_isp_af_focus_in	Focus in
rk_isp_af_focus_out	Focus out

6.10 Audio Module

Function Name	Functionality
rkipc_audio_init	Initialize audio module
rkipc_audio_deinit	Deinitialize audio module
rk_audio_restart	Restart audio module
rk_audio_get_bit_rate	Get bit rate
rk_audio_set_bit_rate	Set bit rate
rk_audio_get_sample_rate	Get sample rate
rk_audio_set_sample_rate	Set sample rate
rk_audio_get_volume	Get volume
rk_audio_set_volume	Set volume
rk_audio_get_enable_vqe	Get audio 3A algorithm enable status
rk_audio_set_enable_vqe	Set audio 3A algorithm enable status
rk_audio_get_encode_type	Get encoding type
rk_audio_set_encode_type	Set encoding type

6.11 Video Module

Function Name	Functionality
rk_video_init	Initialize video module
rk_video_deinit	Deinitialize video module
rk_video_restart	Restart video module
rk_video_get_gop	Get I-frame interval
rk_video_set_gop	Set I-frame interval
rk_video_get_max_rate	Get maximum bitrate
rk_video_set_max_rate	Set maximum bitrate
rk_video_get_RC_mode	Get rate control mode
rk_video_set_RC_mode	Set rate control mode
rk_video_get_output_data_type	Get encoding type
rk_video_set_output_data_type	Set encoding type
rk_video_get_rc_quality	Get rate control quality
rk_video_set_rc_quality	Set rate control quality
rk_video_get_smart	Get smart encoding status
rk_video_set_smart	Set smart encoding status
rk_video_get_gop_mode	Get GOP mode
rk_video_set_gop_mode	Set GOP mode
rk_video_get_stream_type	Get stream name
rk_video_set_stream_type	Set stream name
rk_video_get_h264_profile	Get H.264 profile
rk_video_set_h264_profile	Set H.264 profile
rk_video_get_resolution	Get resolution
rk_video_set_resolution	Set resolution
rk_video_get_frame_rate	Get input frame rate
rk_video_set_frame_rate	Set input frame rate
rk_video_get_frame_rate_in	Get output frame rate
rk_video_set_frame_rate_in	Set output frame rate
rk_video_get_rotation	Get rotation angle
rk_video_set_rotation	Set rotation angle
rk_video_get_smartp_viridrlen	Get smartP virtual I-frame length

Function Name	Functionality
rk_video_set_smartp_viridrlen	Set smartP virtual I-frame length

6.11.1 IVS Module

Function Name	Functionality
rk_video_get_md_switch	Get motion detection switch status
rk_video_set_md_switch	Set motion detection switch status
rk_video_get_md_sensebility	Get motion detection sensitivity
rk_video_set_md_sensebility	Set motion detection sensitivity
rk_video_get_od_switch	Get privacy mask switch status
rk_video_set_od_switch	Set privacy mask switch status

6.11.2 JPEG Module

Function Name	Functionality
rk_video_get_enable_cycle_snapshot	Get timed snapshot switch status
rk_video_set_enable_cycle_snapshot	Set timed snapshot switch status
rk_video_get_image_quality	Get image quality
rk_video_set_image_quality	Set image quality
rk_video_get_snapshot_interval_ms	Get snapshot interval
rk_video_set_snapshot_interval_ms	Set snapshot interval
rk_video_get_jpeg_resolution	Get JPEG resolution
rk_video_set_jpeg_resolution	Set JPEG resolution
rk_take_photo	Capture a photo

6.12 Parameter Management Module

Function Name	Functionality
rk_param_get_int	Get integer parameter
rk_param_set_int	Set integer parameter
rk_param_get_string	Get string parameter
rk_param_set_string	Set string parameter
rk_param_save	Save current parameters to a file
rk_param_init	Initialize from specified ini file
rk_param_deinit	Deinitialize
rk_param_reload	Reload parameters without saving current settings

7. ini Parameter Introduction

Note: Due to variations in product types and definitions, some parameters may be specific to certain products, and the meanings of some parameters may differ. This section is provided for reference only; please refer to comments in the actual ini file for accurate information.

7.1 Audio Module

```
[audio.0]
enable = 1 ; Enable audio functionality
card_name = hw:0,0 ; Sound card name
encode_type = G711A ; Encoding type
format = S16 ; Format
sample_rate = 8000 ; Sampling rate
channels = 1 ; Number of channels
frame_size = 1152 ; Sampling size
bit_rate = 16000 ; Bitrate
input = mic_in ; Input type, currently only supports mic_in
volume = 50 ; Input volume
enable_aed = 0 ; Enable sound detection
enable_bcd = 0 ; Enable cry detection
enable_vqe = 1 ; Enable audio 3A algorithms
vqe_cfg = /oem/usr/share/vqefiles/config_aivqe.json ; Path to audio 3A algorithm
configuration file
```

7.2 Video Module

The `video.source` section is used to control some data streams and module functionalities, as well as features that are applied to all streams, such as rotation.

The `video.x` sections contain detailed parameters for each module, depending on the application scenario.

```
[video.source]
enable_aiq = 1 ; Enable AIQ functionality
enable_vo = 0 ; Enable screen display functionality
vo_dev_id = 3 ; VO device ID, 0 for HDMI, 3 for MIPI, may vary by platform
enable_jpeg = 1 ; Enable JPEG capture functionality
enable_venc_0 = 1 ; Enable the first stream
enable_venc_1 = 1 ; Enable the second stream
enable_venc_2 = 0 ; Enable the third stream
enable_npu = 1 ; Enable NPU algorithms
npu_fps = 10 ; NPU algorithm input frame rate
enable_wrap = 1 ; Enable wrap function
buffer_line = 720 ; Number of lines for wrapping, it is half of the height by
default, half-frame wrap
enable_rtsp = 1 ; Enable RTSP preview
enable_rtmp = 1 ; Enable RTMP preview
rotation = 0 ; Rotation angle, options: 0, 90, 180, 270

[video.0]
buffer_size = 1843200 ; Output buffer size, recommended value: w * h / 2
buffer_count = 4 ; Number of output buffers
enable_refer_buffer_share = 1 ; Enable reference frame and reconstruction frame
sharing
stream_type = mainStream ; Stream name for web identification
video_type = compositeStream ; Stream type for web identification
max_width = 2560 ; Max width of main stream for buffer allocation
max_height = 1440 ; Max height of main stream for buffer allocation
width = 2560
height = 1440
rc_mode = VBR ; Rate control mode
rc_quality = highest ; Rate control quality
src_frame_rate_den = 1 ; Input frame rate denominator
src_frame_rate_num = 25 ; Input frame rate numerator
dst_frame_rate_den = 1 ; Output frame rate denominator
dst_frame_rate_num = 25 ; Output frame rate numerator
mid_rate = 2048 ; Middle bitrate, please see rockit documentation for details
max_rate = 3072 ; Max bitrate, please see rockit documentation for details
min_rate = 200 ; Min bitrate, please see rockit documentation for details
output_data_type = H.265 ; Video encoding type
smart = open ; Enable smart encoding, Please note that it is not smartp
h264_profile = high ; H.264 profile
gop = 50 ; I-frame interval
smartp_viridrlen = 25 ; SmartP virtual I-frame length
gop_mode = normalP ; GOP mode
stream_smooth = 50 ; Stream smoothness, currently not used
; The following are advanced encoding parameters. Please add them as needed. For
detailed instructions, please refer to the rockit and mpp documents
enable_motion_deblur = 1
motion_deblur_strength = 0
enable_motion_static_switch = 0
frame_min_i_qp = 25
frame_min_qp = 26
frame_max_i_qp = 45
frame_max_qp = 48
enable_debreath_effect = 0
debreath_effect_strength = 16
scalinglist = 1
thrd_i = 0,0,0,0,3,3,5,5,8,8,8,15,15,20,25,25
thrd_p = 0,0,0,0,3,3,5,5,8,8,8,15,15,20,25,25
```

```
aq_step_i = -8,-7,-6,-5,-4,-3,-2,-1,0,1,2,3,4,7,8,9
aq_step_p = -8,-7,-6,-5,-4,-3,-2,-1,0,1,2,3,4,7,8,9
qbias_enable = 1
qbias_i = 171
qbias_p = 85
flt_str_i = 2
flt_str_p = 2
cu_dqp = 1
anti_ring = 3
anti_line = 3
lambda = 4
lambda_i = 7
atf_str = 2
tmvp_en = 0
static_frm_num = 5
madp16_th = 15
skip16_wgt = 6
skip32_wgt = 6
qbias_arr = 3,6,13,144,144,144,144,3,6,13,144,144,171,144,85,85,85,85
aq_rnge_arr = 8,8,12,12,12,8,8,12,12,12
lgt_chg_lvl = 0

[video.1]
input_buffer_count = 1 ; Number of input buffers, RV1106 is unique, supports
single buffer in wrap mode
```

7.2.1 IVS Module

```
[ivs]
smear = 0 ; Please refer to rockit documentation for details
weightp = 0 ; Please refer to rockit documentation for details
md = 1 ; Motion detection
od = 1 ; Occlusion detection
md_sensibility = 3 ; Motion detection sensitivity, options: 1 2 3
```

7.2.2 JPEG Module

```
[video.jpeg]
width = 1920 ; Width of jpeg, not effective in wrap mode
height = 1080 ; Height of jpeg, not effective in wrap mode
jpeg_buffer_size = 1048576 ; 1024KB
jpeg_qfactor = 70 ; JPEG image quality
enable_cycle_snapshot = 0 ; Enable cycle snapshot
snapshot_interval_ms = 1000 ; Cycle snapshot interval in milliseconds
```

7.3 ISP Module

In `isp.0`, 0 represents the scenario number, scenario_id = cam_id * MAX_SCENARIO_NUM + current_scenario_id. For example, when MAX_SCENARIO_NUM is 2, the scene 2 for camera 0 has the scenario_id of `0*2+2=2`, and the scene 1 for camera 2 has the scenario_id of `2*2+1=5`.

`init_from_ini` is mainly used for IQ Tuning. When the value is 0, the parameters from the ini file won't override IQ parameters during initialization. The actual effect is based on IQ file parameters.

```
[isp]
scenario = normal ; normal or custom1
init_from_ini = 1 ; Whether to use ini parameters to override IQ parameters
during initialization
normal_scene = day ; Corresponds to the sub_scene field of the first scene in the
IQ file
custom1_scene = night ; Corresponds to the sub_scene field of the second scene in
the IQ file
ircut_open_gpio = 71 ; gpio2 RK_PA7 (N=X*32+Y*8+Z; X:gpioX, Y:0/1/2/...
(RK_PA/B/C/...) Z:RK_PYZ)
ircut_close_gpio = 70 ; gpio2 RK_PA6

; isp.0
[isp.0.adjustment]
contrast    = 50 ; Contrast
brightness  = 50 ; Brightness
saturation  = 50 ; Saturation
sharpness   = 50 ; Sharpness
fps = 25 ; Frame rate
hue = 50 ; Hue

[isp.0.exposure]
iris_type = auto
exposure_mode = auto ; Exposure mode
gain_mode = auto ; Gain mode
auto_iris_level = 5
auto_exposure_enabled = 1
auto_gain_enabled = 1
exposure_time = 1/6 ; Exposure time
exposure_gain = 1 ; Exposure gain

[isp.0.night_to_day]
night_to_day = day ; Day-to-night mode
night_to_day_filter_level = 5 ; Day-to-night transition sensitivity, not
currently used
night_to_day_filter_time = 5 ; Day-to-night transition filtering time, not
currently used
dawn_time = 07:00:00 ; Dawn time, not currently used
dusk_time = 18:00:00 ; Dusk time, not currently used
ircut_filter_action = day ; IR-cut filter trigger state, not currently used
over_exposure_suppress = open ; Over-exposure suppression, not currently used
over_exposure_suppress_type = auto ; Over-exposure suppression mode, not
currently used
fill_light_mode = IR ; Fill light type, IR (infrared) or LED
brightness_adjustment_mode = auto ; Brightness adjustment mode, not currently
used
light_brightness = 1 ; Fill light brightness
distance_level = 1 ; Distance level, not currently used

[isp.0.blc]
blc_region = close ; Backlight compensation
blc_strength = 1 ; Backlight compensation strength
wdr = close ; Wide dynamic range mode, not currently used
wdr_level = 0 ; Wide dynamic range strength, not currently used
```

```
hdr = close ; High dynamic range mode
hdr_level = 50 ; High dynamic range strength
hlc = close ; Highlight suppression
hlc_level = 0 ; Highlight suppression strength
dark_boost_level = 1 ; Dark area enhancement level
position_x = 0 ; Backlight compensation region X coordinate
position_y = 0 ; Backlight compensation region Y coordinate
blc_region_width = 120 ; Backlight compensation region width
blc_region_high = 92 ; Backlight compensation region height

[isp.0.white_blance]
white_blance_style = autoWhiteBalance ; White balance type
white_blance_red = 50 ; White balance red component
white_blance_green = 50 ; White balance green component
white_blance_blue = 50 ; White balance blue component

[isp.0.enhancement]
noise_reduce_mode = close ; Noise reduction mode
denoise_level = 50 ; Noise reduction level
spatial_denoise_level = 50 ; Spatial noise reduction level
temporal_denoise_level = 50 ; Temporal noise reduction level
dehaze = close ; Dehaze mode
dehaze_level = 0 ; Dehaze level
dis = close ; Digital image stabilization, not currently used
gray_scale_mode = [0-255] ; Gray scale range
image_rotation = close ; Image rotation angle, not currently used
distortion_correction = close ; Distortion correction
ldch_level = 0 ; Lateral distortion correction

[isp.0.video_adjustment]
image_flip = close ; Image flip function
scene_mode = indoor ; Scene mode: indoor or outdoor
power_line_frequency_mode = PAL(50HZ) ; Video power line frequency mode

[isp.0.auto_focus]
af_mode = semi-auto ; Auto focus mode
zoom_level = 0 ; Zoom level (enlargement/reduction)
focus_level = 0 ; Focus level
```

7.4 Storage Module

```
[storage]
mount_path = /userdata ; Storage path
free_size_del_min = 500 ; When free space is less than this value, automatic file
deletion starts, unit: MB
free_size_del_max = 1000 ; When free space is greater than this value, automatic
file deletion stops, unit: MB
num_limit_enable = 1; Whether to limit by file quantity, prioritized over
remaining space limit

[storage.0]
enable = 0 ; Whether to enable recording for this stream
folder_name = video0 ; Folder name
file_format = mp4 ; File format, e.g. mp4, flv, ts
file_duration = 60 ; File duration, unit: seconds
video_quota = 30 ; Video quota, currently not used
file_max_num = 300 ; Maximum file quantity
```

7.5 Device Information Module

Used to store some device information, which is generally unchanged.

```
[system.device_info]
deivce_name = RK IP Camera
telecontrol_id = 88
model = RK-003
serial_number = RK-003-A
firmware_version = V0.2.6 build 202108
encoder_version = V1.0 build 202108
web_version = V2.12.2 build 202108
plugin_version = V1.0.0.0
channels_number = 1
hard_disks_number = 1
alarm_inputs_number = 0
alarm_outputs_number = 0
firmware_version_info = CP-3-B
manufacturer = Rockchip
hardware_id = c3d9b8674f4b94f6
user_num = 1
```

7.6 Capability Set Module

This capability set is provided for use by the web frontend. If you need to modify options and ranges for parameters on the web page, you can manually convert them into JSON format, add them, and then split them apart before filling them into the INI file. Due to the default limit of 1024 characters per line in the INI file, it may need to be split.

```
[capability.video]
```

```
0 = {"disabled":[{"name":"sStreamType","options":{"subStream":
{"sSmart":"close"},"thirdStream":{"sSmart":"close"}},"type":"disabled/limit"},
{"name":"sSmart","options":{"open":
{"iGOP":null,"iStreamSmooth":null,"sH264Profile":null,"sRCMode":null,"sRCQuality"
:null,"sSVC":null}},"type":"disabled"},{"name":"sRCMode","options":{"CBR":
{"sRCQuality":null}},"type":"disabled"},{"name":"sOutputDataType","options":
{"H.265":{"sH264Profile":null}},"type":"disabled"},{"name":"unspport","options":
{"iStreamSmooth":null,"sVideoType":null},"type":"disabled"}],"dynamic":{"sSmart":
{"open":{"iMinRate":{"dynamicRange":
{"max":"iMaxRate","maxRate":1,"min":"iMaxRate","minRate":0.125},"type":"dynamicRa
nge"}}},"sStreamType":{"mainStream":{"iMaxRate":{"options":
[256,512,1024,2048,3072,4096,6144],"type":"options"},"sResolution":{"options":
["2560*1440","1920*1080","1280*720"],"type":"options"}},"subStream":{"iMaxRate"
1 = :{"options":[128,256,512],"type":"options"},"sResolution":{"options":
["704*576","640*480","352*288","320*240"],"type":"options"}},"thirdStream":
{"iMaxRate":{"options":[256,512],"type":"options"},"sResolution":{"options":
["416*416"],"type":"options"}}}},"layout":{"encoder":
["sStreamType","sVideoType","sResolution","sRCMode","sRCQuality","sFrameRate","sO
utputDataType","sSmart","sH264Profile","sSVC","iMaxRate","iMinRate","iGOP","iStre
amSmooth"]},"static":{"iGOP":{"range":
{"max":400,"min":1},"type":"range"},"iStreamSmooth":{"range":
{"max":100,"min":1,"step":1},"type":"range"},"sFrameRate":{"dynamicRange":
{"max":"sFrameRateIn","maxRate":1},"options":
["1/2","1","2","4","6","8","10","12","14","16","18","20","25","30"],"type":"optio
ns/dynamicRange"},"sH264Profile":{"options":
["high","main","baseline"],"type":"options"},"sOutputDataType":{"options"
2 = :["H.264","H.265"],"type":"options"},"sRCMode":{"options":
["CBR","VBR"],"type":"options"},"sRCQuality":{"options":
["lowest","lower","low","medium","high","higher","highest"],"type":"options"},"sS
VC":{"options":["open","close"],"type":"options"},"sSmart":{"options":
["open","close"],"type":"options"},"sStreamType":{"options":
["mainStream","subStream","thirdStream"],"type":"options"},"sVideoType":
{"options":["videoStream","compositeStream"],"type":"options"}}}
```


[capability.image_adjustment]


```
0 = {"layout":{"image_adjustment":
["iBrightness","iContrast","iSaturation","iSharpness","iHue"]},"static":
{"iBrightness":{"range":{"max":100,"min":0,"step":1},"type":"range"},"iContrast":
{"range":{"max":100,"min":0,"step":1},"type":"range"},"iHue":{"range":
{"max":100,"min":0,"step":1},"type":"range"},"iSaturation":{"range":
{"max":100,"min":0,"step":1},"type":"range"},"iSharpness":{"range":
{"max":100,"min":0,"step":1},"type":"range"}}}
```


[capability.image_blc]


```
0 = {"disabled":[{"name":"sHLC","options":{"open":
{"sBLCRegion":null}},"type":"disabled"},{"name":"sBLCRegion","options":{"open":
{"iDarkBoostLevel":null,"iHLCLevel":null,"sHLC":null}},"type":"disabled"}],"dynam
ic":{"sBLCRegion":{"open":{"iBLCStrength":{"range":
{"max":100,"min":0,"step":1},"type":"range"}}},"sHDR":{"HDR2":{"iHDRLevel":
{"range":{"max":100,"min":1,"step":1},"type":"range"}},"close":{"sBLCRegion":
{"options":["close","open"],"type":"options"},"sHLC":{"options"
1 = :["close","open"],"type":"options"}}},"sHLC":{"open":{"iDarkBoostLevel":
{"range":{"max":100,"min":0,"step":1},"type":"range"},"iHLCLevel":{"range":
{"max":100,"min":0,"step":1},"type":"range"}}},"sWDR":{"open":{"iWDRLevel":
{"range":{"max":100,"min":0,"step":1},"type":"range"}}}},"layout":{"image_blc":
["sHDR","iHDRLevel","sBLCRegion","iBLCStrength","sHLC","iHLCLevel"]},"static":
{"sHDR":{"options":["close","HDR2"],"type":"options"}}}
```

[capability.image_enhancement]
0 = {"dynamic":{"sDehaze":{"open":{"iDehazeLevel":{"range":
{"max":10,"min":0,"step":1},"type":"range"}}},"sDistortionCorrection":{"FEC":
{"iFecLevel":{"range":{"max":100,"min":0,"step":1},"type":"range"}},"LDCH":
{"iLdchLevel":{"range":
{"max":100,"min":0,"step":1},"type":"range"}}},"sNoiseReduceMode":{"2dnr":
{"iSpatialDenoiseLevel":{"range":
{"max":100,"min":0,"step":1},"type":"range"}},"3dnr":{"iTemporalDenoiseLevel":
{"range":{"max":100,"min":0,"step":1},"type":"range"}},"mixnr":
{"iSpatialDenoiseLevel":{"range":
{"max":100,"min":0,"step":1},"type":"range"},"iTemporalDenoiseLevel":{"range":
{"max":100,"min":0,"step":1},"type":"range"}}}},"layout"
1 = :{"image_enhancement":
["sNoiseReduceMode","iSpatialDenoiseLevel","iTemporalDenoiseLevel","sDehaze","iDe
hazeLevel","sGrayScaleMode","sDistortionCorrection","iLdchLevel","iFecLevel","iIm
ageRotation"]},"static":{"iImageRotation":{"options":
[0,90,270],"type":"options"},"sDIS":{"options":
["open","close"],"type":"options"},"sDehaze":{"options":
["open","close","auto"],"type":"options"},"sDistortionCorrection":{"options":
["LDCH","close"],"type":"options"},"sFEC":{"options":
["open","close"],"type":"options"},"sGrayScaleMode":{"options":["[0-255]","[16-
235]"],"type":"options"},"sNoiseReduceMode":{"options":
["close","2dnr","3dnr","mixnr"],"type":"options"}}}

[capability.image_exposure]
0 = {"dynamic":{"sExposureMode":{"auto":{"iAutoIrisLevel":{"range":
{"max":100,"min":0,"step":1},"type":"range"}},"manual":{"sExposureTime":
{"options":
["1","1/3","1/6","1/12","1/25","1/50","1/100","1/150","1/200","1/250","1/500","1/
750","1/1000","1/2000","1/4000","1/10000","1/100000"],"type":"options"},"sGainMod
e":{"options":["auto","manual"],"type":"options"}}},"sGainMode":{"manual":
{"iExposureGain":{"range":
{"max":100,"min":1,"step":1},"type":"range"}}}},"layout":{"image_exposure":
["sExposureMode","sExposureTime","sGainMode","iExposureGain"]},"static":
{"sExposureMode":{"options":["auto","manual"],"type":"options"}}}

[capability.image_night_to_day]
0 = {"disabled":[{"name":"sNightToDay","options":{"day":
{"iLightBrightness":null,"sFillLightMode":null},"night":
{"iDarkBoostLevel":null,"iHDRLevel":null,"iHLCLevel":null,"sHDR":null,"sHLC":"clo
se"}},"type":"disabled"}],"dynamic":{"sNightToDay":{"auto":
{"iNightToDayFilterLevel":{"options":
[0,1,2,3,4,5,6,7],"type":"options"},"iNightToDayFilterTime":{"range":
{"max":10,"min":3,"step":1},"type":"range"}},"schedule":{"sDawnTime":
{"input":"time","type":"input"},"sDuskTime":
{"input":"time","type":"input"}}},"sOverexposeSuppress":{"open"
1 = :{"sOverexposeSuppressType":{"options":
["auto","manual"],"type":"options"}}},"sOverexposeSuppressType":{"manual":
{"iDistanceLevel":{"range":
{"max":100,"min":0,"step":1},"type":"range"}}}},"layout":{"image_night_to_day":
["sNightToDay","iNightToDayFilterLevel","iNightToDayFilterTime","sDawnTime","sDus
kTime","sFillLightMode","iLightBrightness"]},"static":{"iLightBrightness":
{"range":{"max":100,"min":0,"step":10},"type":"range"},"sNightToDay":{"options":
["day","night"],"type":"options"},"sFillLightMode":{"type":"options","options":
["IR"]}}}

[capability.image_video_adjustment]

```
0 = {"layout":{"image_video_adjustment":
["sPowerLineFrequencyMode","sImageFlip"]},"static":{"sImageFlip":{"options":
["close","flip","mirror","centrosymmetric"],"type":"options"},"sPowerLineFrequenc
yMode":{"options":["PAL(50HZ)","NTSC(60HZ)"],"type":"options"},"sSceneMode":
{"options":["indoor","outdoor"],"type":"options"}}}

[capability.image_white_blance]
0 = {"dynamic":{"sWhiteBlanceStyle":{"manualWhiteBalance":{"iWhiteBalanceBlue":
{"range":{"max":100,"min":0,"step":1},"type":"range"},"iWhiteBalanceGreen":
{"range":{"max":100,"min":0,"step":1},"type":"range"},"iWhiteBalanceRed":
{"range":{"max":100,"min":0,"step":1},"type":"range"}}}},"layout":
{"image_white_blance":
["sWhiteBlanceStyle","iWhiteBalanceRed","iWhiteBalanceGreen","iWhiteBalanceBlue"]
},"static":{"sWhiteBlanceStyle":{"options":
["manualWhiteBalance","autoWhiteBalance","lockingWhiteBalance","fluorescentLamp",
"incandescent","warmLight","naturalLight"],"type":"options"}}}
```

7.7 User Module

```
[user.0]
user_name = admin ; Username
password = YWRtaW4= ; Encrypted user password
user_level = 1 ; User level, administrator=0 operator=1 user=2
```

7.8 OSD Module

```
[osd.common]
enable_osd = 1 ; Enable OSD module
is_presistent_text = 1
attribute = transparent/not-flashing ; Transparency and blinking, not in use
font_size = 32 ; Font size
font_color_mode = customize ; Font color mode
font_color = fff799 ; Font color
alignment = customize ; Alignment mode
boundary = 0 ; Alignment boundary
font_path = /oem/usr/share/simsun_en.ttf ; Font library path
normalized_screen_width = 704 ; Normalized screen width for the web frontend
normalized_screen_height = 480 ; Normalized screen height for the web frontend

[osd.0]
type = channelName ; OSD region type for channel name
enabled = 0 ; Enable this OSD region
position_x = 1104 ; OSD region x-coordinate
position_y = 640 ; OSD region y-coordinate
display_text = Camera 01 ; Display text content

[osd.1]
type = dateTime ; OSD region type for timestamp
enabled = 1
position_x = 16
position_y = 16
```

```
date_style = CHR-YYYY-MM-DD ; Date format
time_style = 24hour ; 24/12-hour format
display_week_enabled = 0 ; Display week

[osd.2]
type = character ; OSD region type for custom text
enabled = 0
position_x = 0
position_y = 0
display_text = null

[osd.3]
type = character
enabled = 0
position_x = 0
position_y = 0
display_text = null

[osd.4]
type = privacyMask ; OSD region type for privacy mask
enabled = 0
position_x = 0
position_y = 0
width = 0
height = 0

[osd.5]
type = privacyMask
enabled = 0
position_x = 0
position_y = 0
width = 0
height = 0

[osd.6]
type = image ; OSD region type for image
enabled = 0
position_x = 16
position_y = 640
image_path = /usr/share/image.bmp ; Image path
```

7.9 Event Module

Currently only supported for rv1126_ipc_rkmedia.

```
[event.regional_invasion]
enabled = 1 ; Enable regional invasion event
position_x = 0
position_y = 0
width = 700
height = 560
proportion = 1 ; Area proportion threshold, 1~100
sensitivity_level = 90 ; Sensitivity, 1~100
time_threshold = 1 ; Time threshold in seconds
```

7.10 ROI Module

```
[roi.0]
stream_type = mainStream ; Stream type
id = 1 ; ROI ID
enabled = 0
name = test ; Custom ROI name
position_x = 0
position_y = 0
width = 0
height = 0
quality_level = 3 ; ROI quality level
```

7.11 Region Clip Module

```
[region_clip.1]
enabled = 0
position_x = 0
position_y = 0
width = 640
height = 480
```

7.12 Tuya Cloud Platform Module

```
[tuya]
enable = 0 ; Enable Tuya cloud platform functionality
use_ini_key = 0 ; Use device triplets from INI
product_key = 4wrrx6gmxh1czhcv
uuid = tuya943c2c4f36a4217c
auth_key = WZUXGSw3Mf0D8C1699rD0Tqi4JUO1M3B
```

7.13 AVS Splicing Module

Note: Currently specific to RK3588, some options are consistent with the [video.source] module.

```
[avs]
format = 1 ; Compression format, 0 is nv12, 1 is fbc
sensor_num = 6 ; Number of cameras
source_width = 2560 ; Width per camera
source_height = 1520 ; Height per camera
; avs 2:5088*1520 4:5440*2700 6:8192*2700
avs_width = 8192 ; Width after splicing
avs_height = 2700 ; Height after splicing
avs_mode = 0 ; AVS splicing mode, 0 for blended splicing, 1 for vertical non-
blended splicing, 2 for horizontal non-blended splicing, 3 for 2 x 2 grid non-
blended splicing.
sync = 1 ; AVS synchronization mode, requires all frame sequence numbers to be
synchronized
```

```
param_source = 0 ; Parameter source, 0 is LUT, 1 is CALIB
calib_file_path = /oem/usr/share/avs_calib/calib_file.pto ; PTO file path
mesh_alpha_path = /oem/usr/share/avs_calib/ ; Path to generated mesh table
middle_lut_path = /oem/usr/share/middle_lut/ ; Middle LUT file path
projection_mode = 0 ; 0 for equidistant cylindrical projection, 1 for rectilinear
projection, 2 for cylindrical projection, 3 for cubic projection
center_x = 4096 ; Position of the projection center on the output image. The
position is usually the center of the output image, indicating that the two
centers coincide.
center_y = 1800
fov_x = 36000 ; Field of view of the spliced output area
fov_y = 8500
ori_rotation_roll = 0 ; Initial rotation angle attribute for spliced output
ori_rotation_pitch = 0
ori_rotation_yaw = 0
rotation_roll = 0 ; Rotation attribute for spliced output
rotation_pitch = 0
rotation_yaw = 0
enable_jpeg = 0
enable_venc_0 = 1
enable_venc_1 = 1
enable_venc_2 = 1
enable_vo = 0
vo_dev_id = 3 ; 0 is hdmi, 3 is mipi
enable_npu = 1
```

7.14 Network Module

```
[network.ntp]
enable = 1 ; Enable network time synchronization
refresh_time_s = 60 ; NTP refresh time in seconds
ntp_server = 119.28.183.184 ; NTP server address
```