



Novatek HDAL Design Specification - hd_videoout

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Table of Content

Novatek HDAL Design Specification - hd_videoout.....	1
1 Introduction	5
1.1 Basic Flow	6
2 Data structure and function definition	8
2.1 Function definition	8
2.1.1 hd_videoout_init	8
2.1.2 hd_videoout_open.....	8
2.1.3 hd_videoout_get.....	9
2.1.4 hd_videoout_set.....	10
2.1.5 hd_videoout_bind	10
2.1.6 hd_videoout_start.....	11
2.1.7 hd_videoout_stop	11
2.1.8 hd_videoout_unbind.....	12
2.1.9 hd_videoout_close	12
2.1.10 hd_videoout_uninit	13
2.2 Single Trigger Operation	14
2.2.1 hd_videoout_push_in_buf	14
2.2.2 hd_videoout_pull_out_buf	15
2.2.3 hd_videoout_release_out_buf	15
2.3 Data structure definition	16
2.3.1 HD_VIDEOOUT_PARAM_SYSCAPS	16
2.3.2 HD_VIDEOOUT_DEV_CONFIG	17
2.3.3 HD_VIDEOOUT_MODE	18
2.3.4 HD_VIDEOOUT_IN	19
2.3.5 HD_VIDEOOUT_CLEAR_WIN	22
2.3.6 HD_VIDEOOUT_WIN_ATTR	22
2.3.7 HD_VIDEOOUT_WIN_PSR_ATTR.....	23
2.3.8 HD_VIDEOOUT_PALETTE_TABLE	24
2.3.9 HD_FB_FMT	25
2.3.10 HD_FB_ATTR	26
2.3.11 HD_FB_ENABLE	27
2.3.12 HD_FB_LAYER_ORDER	28
2.3.13 HD_VIDEOOUT_HDMI_ABILITY.....	29
2.3.14 HD_VIDEOOUT_PARAM_OUT_STAMP_BUF	31
2.3.15 HD_VIDEOOUT_PARAM_OUT_STAMP_IMG	31
2.3.16 HD_VIDEOOUT_PARAM_OUT_STAMP_ATTR	32
2.3.17 HD_VIDEOOUT_PARAM_OUT_MASK_ATTR	33
2.3.18 HD_VIDEOOUT_PARAM_OUT_MOSAIC_ATTR.....	33
3 Debug command	34
3.1 proc command for IPC	34
3.1.1 cat /proc/hdal/vout/info.....	34
3.2 Debug menu for IPC	37
3.2.1 Dump status	38

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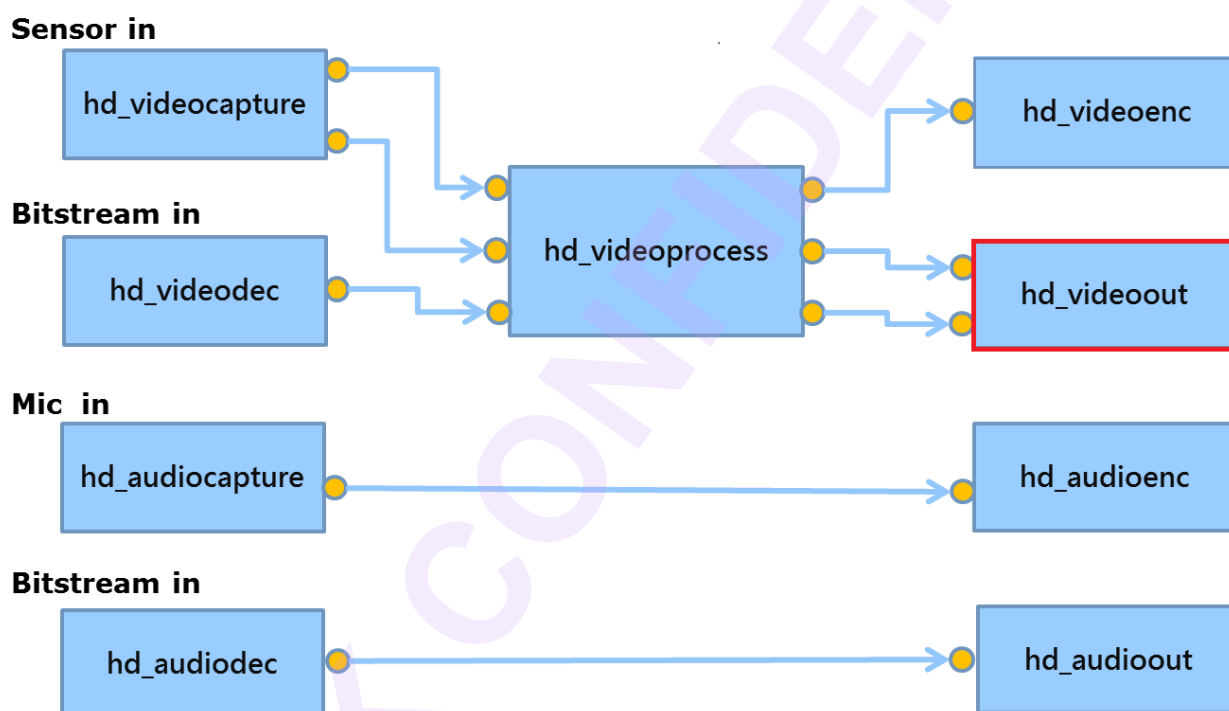
3.3	OSG debug menu.....	39
3.3.1	Dump status	39
3.3.2	Change status	40
3.4	Debug command for NVR	40
3.4.1	Dump info	40
3.4.2	Debug menu	41
3.5	Debug command for IDE engine	42
3.5.1	Dump info	42
4	Sample Codes	44
4.1	hd_video_liveview sample code	44
5	Frequently asked questions.....	48
5.1	[NVR ONLY]	48
5.1.1	Display capture output dim	48
5.1.2	ClearWin	48
5.1.3	Write back and clearwin.....	48
5.2	[IPCAM ONLY]	48
5.2.1	HD_FB_ID	48
5.2.2	Bind vout.....	48
5.2.3	Driver error message	49
5.2.4	Rotate buffer	49
6	Q&A	49

Difference Table (for IPC only)

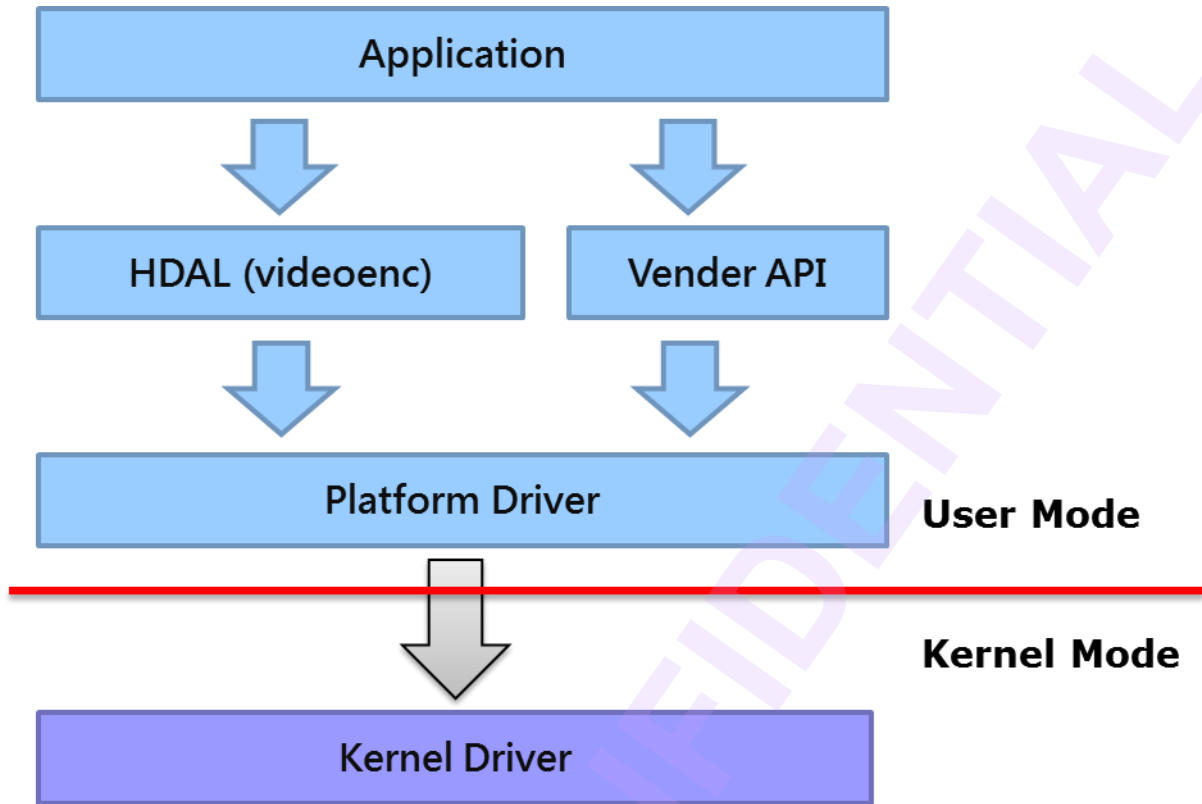
Item	NT9668X	NT9852X
HD_VIDEOOUT_INFUNC in_func = ONEBUF	Not supported.	Support. Configure to enable ONEBUFF mode
HD_VIDEOOUT_PARAM_OUT_STAMP_ATTR alpha	Only for rgb565	For argb4444 、 argb1555 、 rgb565

1 Introduction

The major purpose of hd_videoout is to get YUV raw data from upper unit, and display YUV data to output device. Therefore hd_videoout would configure output device. This document will talk about the red block in the following diagram. The device driver is not the main point in this document.



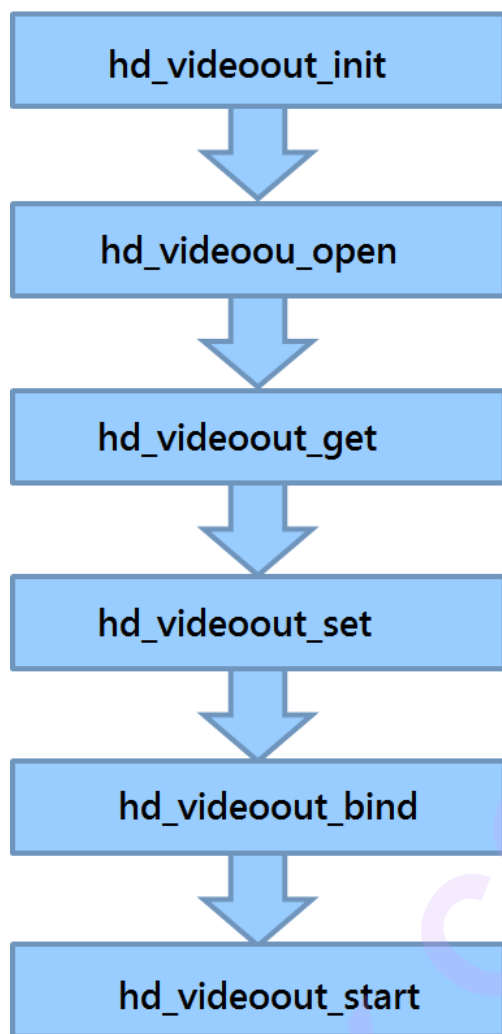
Module diagram is shown as below:



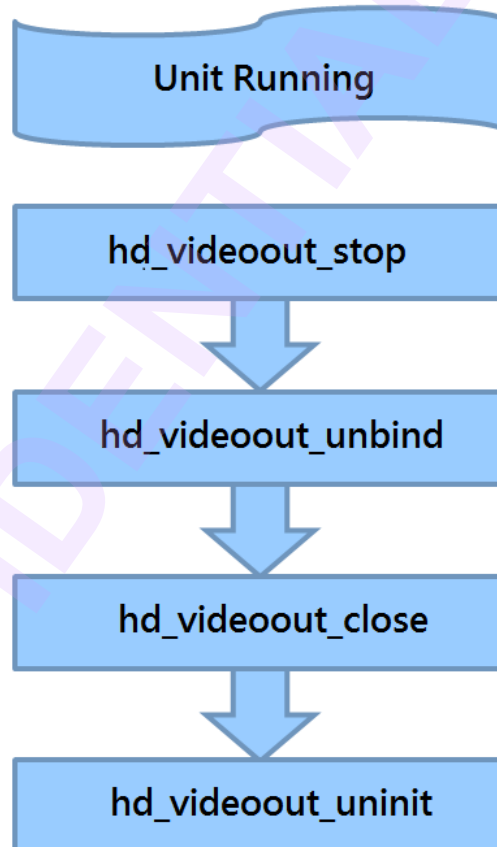
1.1 Basic Flow

The call sequence is needed to be done correctly for the unit. The standard starting flows of most modules are initialized, open, get, set, bind and start. The standard closing flows of most modules are stop, unbind, close and uninitialized. The basic flow is shown as below.

Starting Flow



Closing Flow



Next chapter is mainly about what things to do in those functions above.

2 Data structure and function definition

2.1 Function definition

2.1.1 hd_videoout_init

[Description]

Initialize the unit

[Syntax]

HD_RESULT hd_videoout_init(VOID);

[Parameter]

Value	Description
VOID	Not available

[Return Value]

Value	Description
HD_OK	Success
HD_ERR_NG	Failure

2.1.2 hd_videoout_open

[Description]

Open the unit

[Syntax]

HD_RESULT hd_videoout_open(HD_IN_ID in_id, HD_OUT_ID out_id,
HD_PATH_ID* p_path_id)

[Parameter]

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Value	Description
in_id	id of input port
out_id	id of output port
p_path_id	pointer of the path id

[Return Value]

Value	Description
HD_OK	Success
HD_ERR_NG	Failure

[Note]

For OSG:

1. There are two kinds of OSG : ext and non-ext. ext poses less position limitation but consumes more CPU/DMA. ext is ideal for OSG with small resolution and high position flexibility.
2. Even videoout's OSGs look like non-ext, they are actually implemented by ext. Do not configure too many or large OSGs.

2.1.3 hd_videoout_get

[Description]

Get parameters from unit by path id

[Syntax]

```
HD_RESULT hd_videoout_get(HD_PATH_ID path_id, HD_VIDEOOUT_PARAM_ID id, VOID* p_param)
```

[Parameter]

Value	Description
path_id	the path id
id	id of parameters
p_param	pointer of parameters

[Return Value]

Value	Description
-------	-------------

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HD_OK	Success
HD_ERR_NG	Failure
HD_ERR_NOT_SUPPORT	Not support this parameter

2.1.4 hd_videoout_set

[Description]

Set parameters to unit by path id

[Syntax]

HD_RESULT hd_videoout_set(HD_PATH_ID path_id, HD_VIDEOOUT_PARAM_ID id, VOID* p_param)

[Parameter]

Value	Description
path_id	the path id
id	id of parameters
p_param	pointer of parameters

[Return Value]

Value	Description
HD_OK	Success
HD_ERR_NG	Failure
HD_ERR_NOT_SUPPORT	Not support this parameter

2.1.5 hd_videoout_bind

[Description]

Bind this unit with destination unit

[Syntax]

HD_RESULT hd_videoout_bind(HD_OUT_ID out_id, HD_IN_ID dest_in_id)

[Parameter]

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Value	Description
out_id	id of output port.
dest_in_id	id of input port.

[Return Value]

Value	Description
HD_OK	Success
HD_ERR_NG	Failure

2.1.6 hd_videoout_start

[Description]

Start the unit

[Syntax]

HD_RESULT hd_videoout_start(HD_PATH_ID path_id)

[Parameter]

Value	Description
path_id	pointer of the path id

[Return Value]

Value	Description
HD_OK	Success
HD_ERR_NG	Failure

2.1.7 hd_videoout_stop

[Description]

Stop the unit

[Syntax]

HD_RESULT hd_videoout_stop(HD_PATH_ID path_id)

[Parameter]

Value	Description
path_id	pointer of the path id

[Return Value]

Value	Description
HD_OK	Success
HD_ERR_NG	Failure

2.1.8 hd_videoout_unbind

[Description]

Unbind the unit

[Syntax]

HD_RESULT hd_videoout_unbind(HD_OUT_ID out_id);

[Parameter]

Value	Description
out_id	id of output port.

[Return Value]

Value	Description
HD_OK	Success
HD_ERR_NG	Failure

2.1.9 hd_videoout_close

[Description]

Close the unit

[Syntax]

HD_RESULT hd_videoout_close(HD_PATH_ID path_id)

[Parameter]

Value	Description
path_id	pointer of the path id

[Return Value]

Value	Description
HD_OK	Success
HD_ERR_NG	Failure

[Note]

For OSG:

1. OSGs will keep registered buffer until they are closed. Only after this API returns can application safely access/reclaim the buffer.

2.1.10 hd_videoout_uninit

[Description]

Uninitialize the unit

[Syntax]

HD_RESULT hd_videoout_uninit(VOID);

[Parameter]

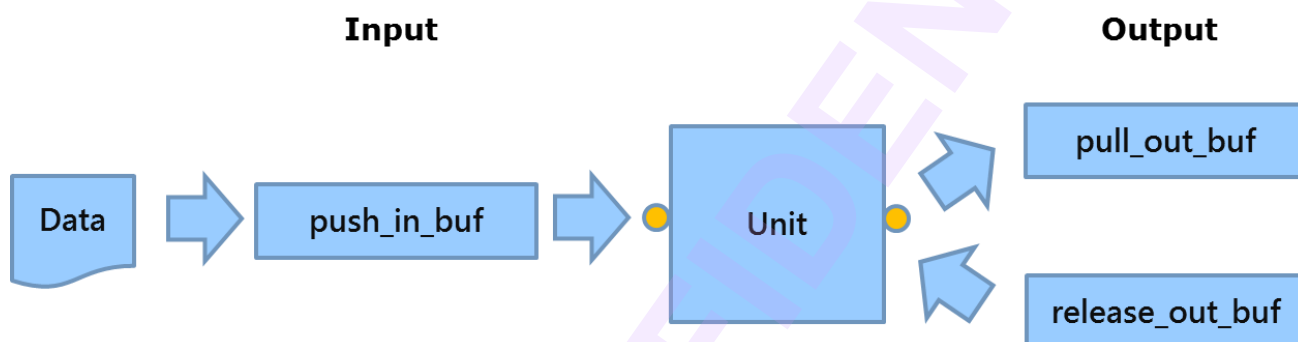
Value	Description
VOID	Not available

[Return Value]

Value	Description
HD_OK	Success
HD_ERR_NG	Failure

2.2 Single Trigger Operation

Single trigger operation is used to trigger the unit to do one job, such as to grab one YUV frame from video process. There are two types of functions for the input port and output port. The sequence for input port is push; the sequence for output port is pull and release. The flow is shown as below.



2.2.1 hd_videoout_push_in_buf

[Description]

Push the video frame buffer to unit

[Syntax]

```
HD_RESULT hd_videoout_push_in_buf(HD_PATH_ID path_id, HD_VIDEO_FRAME*
p_video_frame, HD_VIDEO_FRAME *p_user_out_video_frame, INT32 wait_ms);
```

[Parameter]

Value	Description
path_id	the path id
p_in_video_frame	pointer of the input video frame buffer
p_user_out_video_frame	pointer of the output video frame buffer
wait_ms	timeout value in ms

[Return Value]

Value	Description
HD_OK	Success

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HD_ERR_NG	Failure
-----------	---------

2.2.2 hd_videoout_pull_out_buf

[Description]

Pull the video frame buffer from unit

[Syntax]

```
HD_RESULT hd_videoout_pull_out_buf (HD_PATH_ID path_id,
HD_VIDEO_FRAME* p_video_frame, INT32 wait_ms);
```

[Parameter]

Value	Description
path_id	the path id
p_video_frame	pointer of the output video frame buffer
wait_ms	timeout value in ms

[Return Value]

Value	Description
HD_OK	Success
HD_ERR_NG	Failure

[Difference]

Chip	Description
IPC	Not support.
NVR	All functions are supported.

2.2.3 hd_videoout_release_out_buf

[Description]

Release the video frame buffer which is get from unit

[Syntax]

```
HD_RESULT hd_videoout_release_out_buf (HD_PATH_ID path_id,
```

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HD_VIDEO_FRAME* p_video_frame)

[Parameter]

Value	Description
path_id	the path id
p_video_frame	pointer of the output video frame buffer

[Return Value]

Value	Description
HD_OK	Success
HD_ERR_NG	Failure

[Difference]

Chip	Description
IPC	Not support
NVR	All functions are supported.

2.3 Data structure definition

2.3.1 HD_VIDEOOUT_PARAM_SYSCAPS

[Description]

Structure of get HD_VIDEOOUT_PARAM_SYSCAPS

[Parameter]

Value	Description
dev_id	device id
chip_id	chip id of this device
max_in_count	max count of input of this device
max_out_count	max count of output of this device
max_fb_count	max count of fb of this device
dev_caps	capability of device, using

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	HD_VIDEOOUT_CAPS HD_DEVICE_CAPS
in_caps	capability of input of HD_VIDEO_CAPS and HD_VIDEOOUT_INCAPS
out_caps	capability of output, using HD_VIDEOENC_CAPS
fb_caps	capability of fb, support value:HD_FB_CAPS
input_dim	input dimension width/height
fps	display frame rate
max_scale_up_w	max width scaling up factor
max_scale_up_h	max height scaling up factor
max_scale_down_w	max width scaling down factor
max_scale_down_h	max height scaling down factor
max_out_stamp	max output stamp
max_out_stamp_ex	max output stamp_ex
max_out_mask	max output mask
max_out_mask_ex	max output mask_ex

Example:

```

{
    HD_RESULT ret = HD_OK;
    HD_VIDEOOUT_SYSCAPS video_out_syscaps={0};
    ret = hd_videoout_get(video_out_ctr, HD_VIDEOOUT_PARAM_SYSCAPS,
&video_out_syscaps);
    if (ret != HD_OK) {
        return ret;
    }
    return ret;
}

```

2.3.2 HD_VIDEOOUT_DEV_CONFIG

[Description]

Structure of set HD_VIDEOOUT_PARAM_DEV_CONFIG, NVR only

[Parameter]

Value	Description
mode	Init videoout mode
homology	Only suitable to lcd210. When it is set, it will

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	not register to videograph
chip_state	Only suitable to lcd210. to enable/disable lcd200_0 hw
max_w	Fb max width
max_h	Fb max height
max_bpp	Fb max bit per pixel
gui_rld_enable	Fb rld enabled,only lcd310 fb1 support
ddr_id	Fb buf ddr id
buf_paddr	Fb buffer physical address
buf_len	Fb buffer length
rle_buf_paddr	Fb rle buffer physical address, only valid for gui compress
rle_buf_len	Fb rle buffer length, only valid for gui compress

2.3.3 HD_VIDEOOUT_MODE

[Description]

Structure of get/set HD_VIDEOOUT_PARAM_MODE

[Parameter]

Value	Description
output_type	select display output device
input_dim	NVR only.set input dimension (IPC set input dimension by HD_VIDEOOUT_PARAM_IN)
output_mode	Output device mode; it is union. Each output_type has different mode
lcd	Lcd mode,using HD_VIDEOOUT_LCD_ID
hdmi	HDMI mode,using HD_VIDEOOUT_HDMI_ID
vga	Vga mode,using HD_VIDEOOUT_VGA_ID
cvbs	Cvbs mode,using HD_VIDEOOUT_CVBS_ID

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[Difference]

Chip	Description
IPC	Except input_dim, all functions are supported
NVR	All functions are supported.

Example:

```

{
    HD_RESULT ret = HD_OK;
    HD_VIDEOOUT_MODE videoout_mode = {0};
    HD_PATH_ID video_out_ctrl = 0;
    //open this for device control
    ret = hd_videoout_open(0, HD_VIDEOOUT_0_CTRL, &video_out_ctrl);
    if (ret != HD_OK) {
        return ret;
    }
    videoout_mode.output_type = HD_COMMON_VIDEO_OUT_CVBS;
    videoout_mode.input_dim = HD_VIDEOOUT_IN_AUTO;
    videoout_mode.output_mode.cvbs= HD_VIDEOOUT_CVBS_NTSC;
    ret = hd_videoout_set(video_out_ctrl, HD_VIDEOOUT_PARAM_MODE, &videoout_mode);
    return ret;
}

```

2.3.4 HD_VIDEOOUT_IN

[Description]

Structure of get/set HD_VIDEOOUT_PARAM_IN

[Parameter]

Value	Description
dim	Dimension of input frame
pxlfmt	Format of input frame
dir	Direction of input frame

[Difference]

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Chip	Description
IPC	All functions are supported.
NVR	Not support.

Example:

```

{
    HD_RESULT ret = HD_OK;

    HD_VIDEOOUT_IN video_out_param={0};

    video_out_param.dim.w = p_dim->w;
    video_out_param.dim.h = p_dim->h;
    video_out_param.pxlfmt = HD_VIDEO_PXLfmt_YUV420;
    video_out_param.dir = HD_VIDEO_DIR_NONE;

    ret = hd_videoout_set(video_out_path, HD_VIDEOOUT_PARAM_IN, &video_out_param);
    if (ret != HD_OK) {
        return ret;
    }

    memset((void *)&video_out_param,0,sizeof(HD_VIDEOOUT_IN));
    ret = hd_videoout_get(video_out_path, HD_VIDEOOUT_PARAM_IN, &video_out_param);
    if (ret != HD_OK) {
        return ret;
    }

    printf("##video_out_param w:%d,h:%d %x %x\r\n", video_out_param.dim.w,
video_out_param.dim.h, video_out_param.pxlfmt, video_out_param.dir);

    return ret;
}

```

Note of rotate 1: rotate width/height should be 4*4 alignments.

Note of rotate 2: The user should add one common buffer for rotate.

```

HD_RESULT mem_init(void)
{
    HD_RESULT ret;

    HD_COMMON_MEM_INIT_CONFIG mem_cfg = {0};

    .....

    // config common pool (main)

    mem_cfg.pool_info[1].type = HD_COMMON_MEM_COMMON_POOL;
    mem_cfg.pool_info[1].blk_size = DBGINFO_BUFSIZE()+VDO_YUV_BUFSIZE(VDO_SIZE_W,
VDO_SIZE_H, HD_VIDEO_PXLfmt_YUV420);

    mem_cfg.pool_info[1].blk_cnt = 3+1; //for rotate

```

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```

mem_cfg.pool_info[1].ddr_id = DDR_ID0;

ret = hd_common_mem_init(&mem_cfg);

return ret;
}

HD_RESULT ret = HD_OK;

HD_VIDEOOUT_IN video_out_param={0};

video_out_param.dim.w = stream[0].out_syscaps.output_dim.h;

```

Note of rotate 3: When the user uses the **vertical screen LCD** and then the input size should be swapped for the width and height of the LCD. There is an example to illustrate this situation.

```

{

    HD_RESULT ret = HD_OK;

    HD_VIDEOOUT_IN video_out_param={0};

    video_out_param.dim.w = stream[0].out_syscaps.output_dim.h;

    video_out_param.dim.h = stream[0].out_syscaps.output_dim.w;

    video_out_param.pxlfmt = HD_VIDEO_PXLFMT_YUV420;

    video_out_param.dir = HD_VIDEO_DIR_ROTATE_90;

    ret = hd_videoout_set(video_out_path, HD_VIDEOOUT_PARAM_IN, &video_out_param);

    if (ret != HD_OK) {

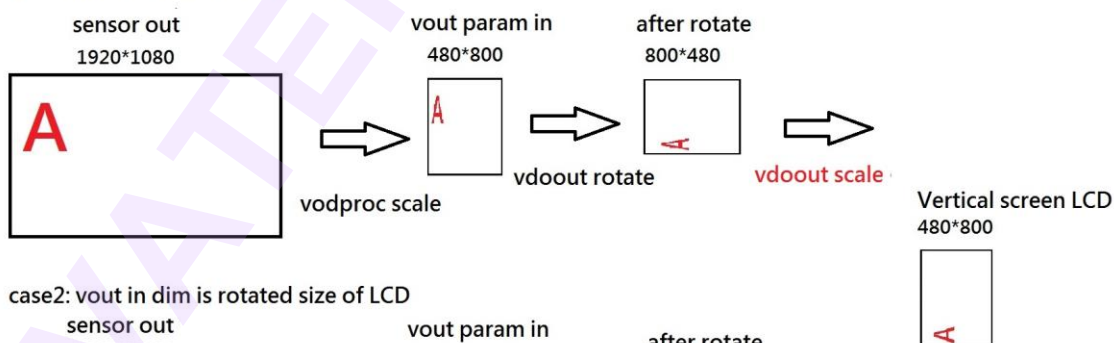
        return ret;

    }

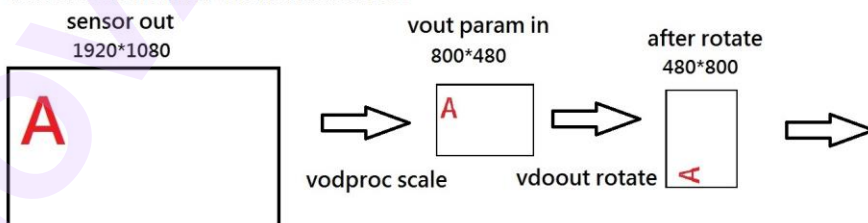
}

```

case1:vout in dim is the same as LCD



case2: vout in dim is rotated size of LCD



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2.3.5 HD_VIDEOOUT_CLEAR_WIN

[Description]

Structure of get/set HD_VIDEOOUT_PARAM_CLEAR_WIN

[Parameter]

Value	Description
input_dim	pattern buffer dim, minimum input dim: 64x32
in_fmt	pattern format
buf	pattern buffer
output_rect	clear win region
mode	clear win mode

[Difference]

Chip	Description
IPC	Not support.
NVR	All functions are supported.

2.3.6 HD_VIDEOOUT_WIN_ATTR

[Description]

Structure of get/set HD_VIDEOOUT_PARAM_IN_WIN_ATTR

[Parameter]

Value	Description
visible	Secide this win to show
rect	Set lcd input port dimension.
layer	Layer order, using HD_WIN_LAYER

[Difference]

Chip	Description
IPC	Only support 1 window.it can config display window x, y, h and w. Not support PIP.

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NVR

All functions are supported.

Example: (IPC sample)

```
{
    HD_VIDEOOUT_WIN_ATTR video_out_param;

    video_out_param.visible = 1;
    video_out_param.rect.x = 20;
    video_out_param.rect.y = 20;
    video_out_param.rect.w = stream[0].out_syscaps.output_dim.w-20;
    video_out_param.rect.h = stream[0].out_syscaps.output_dim.h-20;
    video_out_param.layer = HD_LAYER1;

    ret = hd_videoout_set(stream[0].out_path,HD_VIDEOOUT_PARAM_IN_WIN_ATTR,
&video_out_param);

    memset((void *)&video_out_param,0,sizeof(HD_VIDEOOUT_WIN_ATTR));
    hd_videoout_get(stream[0].out_path,HD_VIDEOOUT_PARAM_IN_WIN_ATTR,
&video_out_param);
}
```

2.3.7 HD_VIDEOOUT_WIN_PSR_ATTR

[Description]

Structure of get/set HD_VIDEOOUT_PARAM_IN_WIN_PSR_ATTR

[Parameter]

Value	Description
visible	decide the Picture-Second-Region's win to show
rect	set lcd input port dim

[Difference]

Chip	Description
IPC	Not support.
NVR	All functions are supported.

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2.3.8 HD_VIDEOOUT_PALETTE_TABLE

[Description]

Structure of get/set HD_VIDEOOUT_PARAM_PALETTE_TABLE

[Parameter]

Value	Description
fb_id	select frame buffer layer,using HD_FB_ID
table_size	palette table size
p_table	palette table array

[Difference]

Chip	Description
IPC	Palette value is ARGB8888.
NVR	Palette value is ARGB8565.

Example:

```
#define ARBG_8888_RED          0xFFFF0000
#define ARBG_8888_GREEN       0xFF00FF00
#define ARBG_8888_BLUE        0xFF0000FF
#define ARBG_8888_PINK        0x80FF00FF

{
    HD_RESULT ret = HD_OK;

    HD_VIDEOOUT_PALETTE_TABLE video_out_palette={0};
    UINT32
    table[256]={ARBG_8888_PINK,ARBG_8888_RED,ARBG_8888_GREEN,ARBG_8888_BLUE,0};

    video_out_palette.fb_id = HD_FB0;
    video_out_palette.table_size = 256;
    video_out_palette.p_table = table;

    ret = hd_videoout_set(video_out_ctrl, HD_VIDEOOUT_PARAM_PALETTE_TABLE,
    &video_out_palette);
    if(ret!= HD_OK)
        return ret;

    memset((void *)&video_out_palette,0,sizeof(HD_FB_ENABLE));
    video_out_palette.fb_id = HD_FB0;
```

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```

ret = hd_videoout_get(video_out_ctrl, HD_VIDEOOUT_PARAM_PALETTE_TABLE,
&video_out_palette);
if(ret!= HD_OK)
return ret;
printf("##video_out_palette id:%d,table_size:%d %x %x %x
%x\r\n",video_out_palette.fb_id,video_out_palette.table_size,video_out_palette.p_table
[0]
,video_out_palette.p_table[1],video_out_palette.p_table[2],video_out_palette.p_ta
ble[3]);

return ret;
}

```

2.3.9 HD_FB_FMT

[Description]

Structure of get/set HD_VIDEOOUT_PARAM_FB_FMT

[Parameter]

Value	Description
fb_id	select frame buffer layer,using HD_FB_ID
fmt	set fb input format,using HD_VIDEO_PXLFMT

Example:

```

{
HD_RESULT ret = HD_OK;
HD_FB_FMT video_out_fmt={0};

video_out_fmt.fb_id = HD_FB0;
video_out_fmt.fmt = HD_VIDEO_PXLFMT_ARGB4444;

ret = hd_videoout_set(video_out_ctrl, HD_VIDEOOUT_PARAM_FB_FMT, &video_out_fmt);
if(ret!= HD_OK)
return ret;

memset((void *)&video_out_fmt,0,sizeof(HD_FB_FMT));
}

```

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```

video_out_fmt.fb_id = HD_FB0;

ret = hd_videoout_get(video_out_ctr1, HD_VIDEOOUT_PARAM_FB_FMT, &video_out_fmt);

if(ret!= HD_OK)

    return ret;

printf("##video_out_fmt id:%d,fmt:%x \r\n",video_out_fmt.fb_id,video_out_fmt.fmt);

return ret;

}

```

2.3.10 HD_FB_ATTR

[Description]

Structure of get/set HD_VIDEOOUT_PARAM_FB_ATTR

[Parameter]

Value	Description
fb_id	select frame buffer layer,using HD_FB_ID
alpha_blend	0~255,except ARBG format,ARBG format would refer pixel alpha
alpha_1555	0~255, only for ARBG1555 format; the pixel alpha 1 would refer the value. All screen alpha which value is 1 is presented as this value.
colorkey_en	color key function.0:disable/1:enable
r_ckey	Red value of color key; key value would depend on pixel format. ex ARGB8888, the value should be 8 bits red part of ARGB8888
g_ckey	Green value of color key; key value would depend on pixel format. ex ARGB8888, the value should be 8 bits green part of ARGB8888
b_ckey	Blue value of color key; key value would depend on pixel format. ex ARGB8888, the value should be 8 bits blue part of

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	ARGB8888
--	----------

Example:

```
{
    HD_RESULT ret = HD_OK;

    HD_FB_ATTR video_out_attr={0};

    video_out_attr.fb_id = HD_FB0;
    video_out_attr.alpha_blend = 255;
    video_out_attr.alpha_1555 = 0; // in ARGB8888 is useless
    video_out_attr.colorkey_en = 1;

    // set ARGB8888 format color key is pink color
    video_out_attr.r_key = 0xFF;
    video_out_attr.g_key = 0;
    video_out_attr.b_key = 0xFF;

    ret = hd_videoout_set(video_out_ctrl, HD_VIDEOOUT_PARAM_FB_ATTR, &video_out_attr);
    if(ret != HD_OK)
        return ret;

    memset((void *)&video_out_attr, 0, sizeof(HD_FB_ATTR));
    video_out_attr.fb_id = HD_FB0;
    ret = hd_videoout_get(video_out_ctrl, HD_VIDEOOUT_PARAM_FB_ATTR, &video_out_attr);
    if(ret != HD_OK)
        return ret;

    printf("##output video_out_attr id:%d,alpha_blend:%d 1555 %d en %d\n",
        video_out_attr.fb_id, video_out_attr.alpha_blend, video_out_attr.alpha_1555, video_out_attr.colorkey_en);

    return ret;
}
```

2.3.11 HD_FB_ENABLE

[Description]

Structure of get/set HD_VIDEOOUT_PARAM_FB_ENABLE

[Parameter]

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Value	Description
fb_id	select frame buffer layer,using HD_FB_ID
enable	layer activate.0:disable, 1:enable

Example:

```

{
    HD_RESULT ret = HD_OK;

    HD_FB_ENABLE video_out_enable={0};

    video_out_enable.fb_id = HD_FB0;
    video_out_enable.enable = TRUE;

    ret = hd_videoout_set(video_out_ctrl, HD_VIDEOOUT_PARAM_FB_ENABLE,
&video_out_enable);
    if(ret!= HD_OK)
        return ret;
    memset((void *)&video_out_enable,0,sizeof(HD_FB_ENABLE));

    video_out_enable.fb_id = HD_FB0;
    ret = hd_videoout_get(video_out_ctrl, HD_VIDEOOUT_PARAM_FB_ENABLE,
&video_out_enable);
    if(ret!= HD_OK)
        return ret;
    printf("##video_out_enable id:%d,en:%d\n",video_out_enable.fb_id,video_out_enable.enable);

    return ret;
}

```

2.3.12 HD_FB_LAYER_ORDER

[Description]

Structure of get/set HD_VIDEOOUT_PARAM_FB_LAYER_ORDER

[Parameter]

Value	Description
-------	-------------

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fb_id	select fb id
fb_to_plane_num	fb_id layer

[Difference]

Chip	Description
IPC	Not support. IPC cannot change layer order.
NVR	All functions are supported.

2.3.13 HD_VIDEOOUT_HDMI_ABILITY

[Description]

Structure of get HD_VIDEOOUT_PARAM_HDMI_ABILITY. User should plug HDMI to platform; therefor user can get DHMI ability.

[Parameter]

Value	Description
video_id	Array of HDMI device supported EDID.(refer to HD_VIDEOOUT_HDMI_ID)
len	Array size. Maxim is 32

[Difference]

Chip	Description
IPC	All functions are supported.
NVR	Not Support.

Example:

```

{
    HD_VIDEOOUT_HDMI_ABILITY hdmi_ability = {0};
    ret = hd_videoout_get(video_out_ctrl, HD_VIDEOOUT_PARAM_HDMI_ABILITY,
    &hdmi_ability);
    if(ret==0)
    {
        UINT32 ii=0;
        for (ii = 0; ii < hdmi_ability.len; ii++) {
            printf("Video Ability %d:

```

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```
%d\r\n", (UINT32)ii, (UINT32)hdm_ability.video_id[ii]);  
    }  
    }  
}
```

2.3.14 HD_VIDEOOUT_PARAM_OUT_STAMP_BUF

[Description]

Stamp buffer settings

[Parameter]

Value	Description
type	NVR/IPC. ping pong buffer or single buffer, using HD_OSG_BUF_TYPE
size	NVR/IPC. buffer's size in byte
p_addr	NVR/IPC. buffer's physical address
ddr_id	NVR only. p_addr's ddr id

[Note]

For IPCam:

1. Different OSGs can share the same buffer to save memory
2. Double buffer requires "2 * max OSG resolution * sizeof(short)" while single buffer requires only "max OSG resolution * sizeof(short)". But single buffer suffers from blinking when image is updated.
3. The starting address and length should be 4bytes aligned.

2.3.15 HD_VIDEOOUT_PARAM_OUT_STAMP_IMG

[Description]

Stamp image settings

[Parameter]

Value	Description
fmt	NVR/IPC. RGB565/ARGB1555/ARGB4444/ARGB8888/ Using HD_VIDEO_PXL_FMT struct
dim	NVR/IPC. image's width and height, using HD_DIM struct
p_addr	NVR/IPC. image's bitmap content
ddr_id	NVR only. p_addr's ddr id

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copy	IPC only .use cpu or dma to copy image. only for hd_xxx_get()
------	---

[Note]

For IPCam:

1. Only RGB565/ARGB1555/ARGB4444 are supported
2. Image width and height are best to be multiple of 2 for best compatibility.
3. In addition to the whole image width and height, every color area(e.g. timestamp and border)'s width and height should be multiple of 2.
4. hd_videoout_get retrieves free buffer(not accessed by hardware) for OSG of ping pong buffer

2.3.16 HD_VIDEOOUT_PARAM_OUT_STAMP_ATTR

[Description]

Stamp attr settings

[Parameter]

Value	Description
align_type	NVR only. to which corner is stamp aligned Using HD_OSG_ALIGN_TYPE struct
alpha	NVR/IPC. (DISP)alpha value
position	NVR/IPC. (DISP)stamp's x,y position, using HD_IPOINT struct
colorkey_en	IPC only. is colorkey used to filter background
colorkey_val	IPC only. filtered background color
qp_en	Not used
qp_fix	Not used
qp_val	Not used
layer	Not used
region	Not used
gcac_enable	NVR only. (GCAC)gcac enable
gcac_blk_width	NVR only. unit width of GCAC
gcac_blk_height	NVR only. unit height of GCAC. Note: OSG dim / (gcac_blk_width* gcac_blk_height) must less than 64

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[Note]

For IPCam:

1. align_type is not supported
2. For ARGB4444, alpha field is not applicable. For ARGB1555. alpha[3..0] is for pixels of A = 0 and alpha[7..4] is for pixels of A = 1.
3. X y are best to be multiple of 2 for best compatibility

2.3.17 HD_VIDEOOUT_PARAM_OUT_MASK_ATTR

[Description]

Mask attribute settings

[Parameter]

Value	Description
type	NVR/IPC. mask is solid or hollow. Using HD_OSG_MASK_TYPE
color	IPC. mask color in rgb, NVR.mask palette index
alpha	NVR/IPC. mask transparency
position	NVR/IPC. 4 vertices' position, using HD_UPOINT struct
thickness	IPC only. border width for hollow mask

[Note]

For IPCam:

1. position[0] should be the top left. Others should be in clockwise order.
2. thickness should be multiple of 2
3. Hollow mask takes more time to complete than solid mask. Don't set over 4 hollow masks in a path.

2.3.18 HD_VIDEOOUT_PARAM_OUT_MOSAIC_ATTR

[Description]

Mosaic attribute settings

[Parameter]

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Value	Description
Type	NVR only. mask is solid or inversion. Using HD_OSG_MASK_TYPE struct
Alpha	NVR only. mask alpha blending. range: 0 ~ 256 (0: foreground, 256: background)
mosaic_blk_w	NVR/IPC. width of internal block
mosaic_blk_h	NVR/IPC. height of internal block
position	NVR/IPC. 4 vertices' position, using HD_UPOINT struct

[Note]

For IPCam:

1. Mosaic is not supported

3 Debug command

The videoout module supports two kinds of debug mechanism for user. User can use proc command or debug menu to debug.

3.1 proc command for IPC

3.1.1 cat /proc/hdal/vout/info

The result will show the videoout information by five parts.

1. **PATH & BIND**: bind status of hd_videoout.
2. **DEV CONFIG**: display device configuration, referring to HD_VIDEOOUT_PARAM_MODE.
3. **IN FRAME**: videoout push in configuration, referring to HD_VIDEOOUT_IN.
4. **IN WIN**: videoout window attribute, referring to HD_VIDEOOUT_WIN_ATTR
5. **FB**: videoout frame buffer attribute, referring to HD_VIDEOOUT_PARAM_FB_FMT/ HD_VIDEOOUT_PARAM_FB_ATTR/ HD_VIDEOOUT_PARAM_FB_ENABLE
6. **IN WORK STATUS**: videoout working status, ex push frame rate, process frame

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rate and release frame rate, if the status frame rate is not normal, can refer to drop, warn and err count

The parameters description of “**PATH & BIND**” can reference the below table.

Parameter	Description
in	Input port ID
out	Output port ID
state	Device status
bind_src	Input port binding source
bind_dest	Output port binding destination

The parameters description of “**DEV CONFIG**” can reference the below table.

Value	Description
max	maximum input id
w	Display device dimension width
h	Display device dimension height
type	Device type (LCD/DHMI/CBVS)

The parameters description of “**IN FRAME**” can reference the below table.

Value	Description
in	Input id
w	Current input dimension width
h	Current input dimension height
pxlfmt	Current input pixel format. user assign pixel format see HD_VIDEO_PXLFORMAT
dir	current input direction. X: mirror Y: flip R: rotate 90 degree L: rotate 270 degree see HD_VIDEO_DIR

The parameters description of “**IN WIN**” can reference the below table.

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If user set HD_VIDEOOUT_PARAM_IN_WIN_ATTR, the debug information would dump status; otherwise there is no IN_WIN status

Parameter	Description
visible	Visible or not
x	Width start position
y	Height start position
w	Window width. If window width is different from device; IDE would scale to window size
h	Window height. If window height is different from device; IDE would scale to window size

The parameters description of “**FB**” can reference the below table.

If user set HD_VIDEOOUT_PARAM_FB_FMT/ HD_VIDEOOUT_PARAM_FB_ATTR/ HD_VIDEOOUT_PARAM_FB_ENABLE, the debug information would dump status; otherwise there is no FB status

Parameter	Description
enable	Frame buffer config is enable or not
pxlfmt	Frame buffer pixel format
blend	Frame buffer blend effect with video frame (value is 0~255)
Alpha_1555	When pixel format is ARGB1555, the Alpha is 1, it would refer to this value which is blending effect with video frame. (value is 0~255). All screen ARGB1555 alpha 1 would be the same result.
ckey_enable	Color key is enable or not
Color_key	Color key value.

The parameters description of “**IN WORK STATUS**” can reference the below table.

This table would dump frame push/process/release status. Those value is average per second.

Parameter	Description
in	Input port
PUSH	Push in frame count/per second.
drop	Push drop frame count/per second.
wrn	Push warning frame count/per second.
err	Push error frame count/per second.
PROC	Process frame count/per second. It would be push successfully frame.

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drop	Process drop frame count/per second.
wrn	Process warning frame count/per second.
err	Process error frame count/per second.
REL	Release frame count/per second.

Example:

```

----- VIDEOOUT 0 PATH & BIND -----
in  out  state bind_src          bind_dest
0   0    START VIDEOPROC_0_OUT_0  (null)

----- VIDEOOUT 0 DEV CONFIG -----
max  w    h    type
0    960  240  LCD

----- VIDEOOUT 0 IN FRAME -----
in  w    h    pxlfmt dir
0    960  240  YUV420 ....

----- VIDEOOUT 0 IN WIN -----
visible x    y    w    h
1        0    0    920 240

----- VIDEOOUT 0 FB0 -----
enable pxlfmt  blend alpha_1555 ckey_enable color_key
1        ARGB4444 255  255      0        0x00000000

=====
----- VIDEOOUT 0 IN WORK STATUS -----
in  PUSH drop wrn  err  PROC drop wrn  err  REL
0   30   0   0   0   30   0   0   0   30

```

3.2 Debug menu for IPC

In application, call `hd_debug_run_menu()` to open the debug menu.

```

=====
HDAL
-----
01 : AUDIOCAPTURE
02 : AUDIOOUT

```

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```

03 : AUDIOENC
04 : AUDIODEC
05 : VIDEOCAPTURE
06 : VIDEOOUT
07 : VIDEOPROCESS
08 : VIDEOENC
09 : VIDEODEC
10 : OSG
11 : COMMON
12 : UTIL
13 : DEBUG

```

```

-----
254 : Quit
255 : Return
-----

```

The currently supported videoout module debug menu is as below.

```

=====
VIDEOOUT
-----

```

```

01 : dump status
-----

```

3.2.1 Dump status

Enter “1” to show the status of videoout

As bellow, the debug menu shows the path & bind information, path_config, input frame information.

```

----- VIDEOOUT 0 PATH & BIND -----
in  out  state bind_src      bind_dest
0   0     START VIDEOPROC_0_OUT_0 (null)
----- VIDEOOUT 0 DEV CONFIG -----
max  w    h    type
0   960  240  LCD
----- VIDEOOUT 0 IN FRAME -----
in  w    h    pxlfmt dir
0   960  240  YUV420 ....

```

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```
----- VIDEOOUT 0 IN WIN -----
visible x      y      w      h
1        0      0      920  240

----- VIDEOOUT 0 FBO -----
enable pxlfmt   blend alpha_1555 ckey_enable color_key
1        ARGB4444 255    255        0          0x00000000
=====
----- VIDEOOUT 0 IN WORK STATUS -----
in  PUSH drop wrn  err  PROC drop wrn  err  REL
0   30   0   0    0   30   0   0    0   30
```

The proc command and debug menu mapping table is as below:

Proc command	Debug menu
cat /proc/hdal/vout/info	dump videoout information

3.3 OSG debug menu

3.3.1 Dump status

cat /proc/hdal/osg/info to show the status of OSG and focus on VIDEOOUT

-----VIDEOOUT 0 BUFFER-----									
pid	type	fmt	w	h	addr	size	draw		
0	pp	4444	1000	200	13a55000	400000	1		
0	pp		0	0	13ab6a80	400000	0		
-----VIDEOOUT 0 STAMP-----									
pid	start	x	y	alpha	cken	ckval	layer	rgn	
0	1	0	0	255	0	0	0	0	
-----VIDEOOUT 0 MASK-----									
pid	start	x	y	w	h	solid	thick	color	alpha
0	1	500	0	100	120	1	0	ff0000	255

As above, the debug menu shows buffer, stamp and mask configuration of all videoout's OSGs. Most values are simply from hd_videoout_set and self-explained. pid serves as an internal serial number and is mainly used to associate stamp and

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buffer information. start reflects if hd_videoout_start/hd_videoout_stop had been applied to that OSG.

3.3.2 Change status

OSG attr can be changed through debug menu while buffer and image can't because buffer and image typically require a buffer which can't be created by shell console. To change an OSG's attr, echo *data* > /proc/hdal/osg/cmd. Below are the format of *data*:

1. For stamp: phase osg pid io start x y alpha cken ckval layer region
example: to set the 5th stamp of device id 3 of videoout to position[1024,512] and layer(1) region(8), run "echo videoout stamp 5 3 1 1024 512 255 0 0 1 8"
2. For mask : phase osg pid io start x y w h solid thick color alpha
example: to set the 5th green mask of device id 3 of videoout to position[1024,512] and size 256x128, run "echo videoout mask 5 3 1 1024 512 256 128 1 0 0xFF00 255"

3.4 Debug command for NVR

3.4.1 Dump info

```
[dump info]
cat /proc/videograph/hdal_setting
```

The result will show the videoout information.

```
root@NVTEVM:/$ cat /proc/videograph/hdal_setting

----- VIDEOOUT 0 SYSCAP -----
in_w  in_h  out_w  out_h  fps  scal_up scal_down
1920  1080  1920  1080  60   4, 4    8, 8
----- VIDEOOUT 0 PATH & BIND -----
in    out    state  bind_src          bind_dest
0     0     START  VIDEOPROC_0_OUT_0 -
1     0     START  VIDEOPROC_1_OUT_0 -
2     0     START  VIDEOPROC_2_OUT_0 -
3     0     START  VIDEOPROC_3_OUT_0 -
----- VIDEOOUT 0 WIN -----
x     y     w     h     visible
0     0     960   540   1
960   0     960   540   1
0     540   960   540   1
```

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3.4.2 Debug menu

In application, call `hd_debug_run_menu()` to open the debug menu.

HDAL

01 : AUDIOCAPTURE
02 : AUDIOOUT
03 : AUDIOENC
04 : AUDIODEC
05 : VIDEOCAPTURE
06 : VIDEOOUT
07 : VIDEOPROCESS
08 : VIDEOENC
09 : VIDEODEC
10 : GFX
11 : VENDOR
12 : COMMON
13 : UTIL
14 : DEBUG

254 : Quit
255 : Return

The currently supported videoout module debug menu is as below.

=====
VIDEOOUT

01 : dump status

Output result:
----- VIDEOOUT 0 SYSCAP -----
in_w in_h out_w out_h fps scal_up scal_down
1920 1080 1920 1080 60 4, 4 8, 8

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----- VIDEOOUT 0 PATH & BIND -----				
in	out	state	bind_src	bind_dest
0	0	START	VIDEOPROC_0_OUT_0	-
1	0	START	VIDEOPROC_1_OUT_0	-
2	0	START	VIDEOPROC_2_OUT_0	-
3	0	START	VIDEOPROC_3_OUT_0	-
4	0	OPEN	-	-
5	0	OPEN	-	-
6	0	OPEN	-	-
7	0	OPEN	-	-
----- VIDEOOUT 0 WIN -----				
x	y	w	h	visible
0	0	960	540	1
960	0	960	540	1
0	540	960	540	1
960	540	960	540	1
0	0	0	0	0
0	0	0	0	0
0	0	0	0	0
0	0	0	0	0

3.5 Debug command for IDE engine

3.5.1 Dump info

```
[dump info]
modprobe drvdump
cat /proc/nvt_info/drvdump/info
```

The above command can dump IPCam driver information, and related to _videoout is ide dump. It contains the display engine and LCD setting.

```
##### IDE1 #####
idec_dump_info:=====
idec_dump_info:ide 1
idec_dump_info:=====
idec_dump_info:IDE_EN=1
idec_dump_info:-----
idec_dump_info:OUTPUT DEVICE = 1
idec_dump_info:OUTPUT mode = 0
idec_dump_info:-----
```

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```

idec_dump_info:ide1-module clk:18562500(hz)
idec_dump_info:-----
idec_dump_info:Px1CLK: 18562500(Hz)
idec_dump_info:-----
idec_dump_info:Output Timing: H-Sync=1 H-Total=1223 H-Start=204 H-End=1163
idec_dump_info:Output Timing: V-Sync=1 V-Total=261 Vodd-Start=18 Vodd-End=257
idec_dump_info:                                Veven-Start=18 Veven-End=257
idec_dump_info:-----
idec_dump_info:Frame Rate: 57(fps)
idec_dump_info:-----
idec_dump_info:
idec_dump_info:=====
idec_dump_info:==          v1          v2(ide2 not support)          01          ==
idec_dump_info:=====
idec_dump_info:Format          10          9          0
idec_dump_info:-----
idec_dump_info:Enable          1          0          0
idec_dump_info:-----
idec_dump_info:Buf width(pix)  960          320          320
idec_dump_info:Buf Height      240          240          240
idec_dump_info:Buf Loff        960          320          320
idec_dump_info:-----
idec_dump_info:Win width        960          320          320
idec_dump_info:Win Height      240          240          240
idec_dump_info:Win (x,y)      ( 0, 0)      ( 0, 0)      ( 0, 0)
idec_dump_info:-----
idec_dump_info:Bandwidth        12          0          0
idec_dump_info:Bandwidth Total  12 (MB/s)
idec_dump_info:-----
idec_dump_info:
idec_dump_info:=====
idec_dump_info:|=====
idec_dump_info:Win (x,y)
idec_dump_info:|
idec_dump_info:Win Dim(w,h)
idec_dump_info:|
idec_dump_info:Hor Dim(h,v)
idec_dump_info:|
idec_dump_info:color(y,u,v)
idec_dump_info:|
idec_dump_info:
idec_dump_info:=====
idec_dump_info:|=====
idec_dump_info:line 0
idec_dump_info:|
idec_dump_info:line 1
idec_dump_info:|
idec_dump_info:line 2
idec_dump_info:|
idec_dump_info:line 3
idec_dump_info:|
idec_dump_info:color
idec_dump_info:|
idec_dump_info:
idec_dump_info:
idec_dump_info>Note: Format Code (0): not support (1): not support (2): not support

```

```
idec_dump_info:Note: Format Code (3): Palette-8bit (4): not support (5): not support
idec_dump_info:Note: Format Code (6): not support (7): not support (8): ARGB8565
idec_dump_info:Note: Format Code (9): YUV422PACK (10): YUV420PACK (11): ARGB8888
idec_dump_info:Note: Format Code (12): ARGB4444 (13): ARGB1555
```

4 Sample Codes

4.1 hd_video_liveview sample code

```
...
#include "hdal.h"
int main(int argc, char** argv)
{
    HD_RESULT ret;
    UINT32 out_type = 0;
    VIDEO_LIVEVIEW liveview = {0};
    INT key;

    //set dimension for videocap
    liveview.dim.w = VDO_SIZE_W;
    liveview.dim.h = VDO_SIZE_H;

    if (argc == 2) {
        out_type = atoi(argv[1]);
        printf("out_type %d\r\n", out_type);
    }
    //init hdal
    ret = hd_common_init(0);
    if(ret != HD_OK) {
        printf("common fail=%d\r\n", ret);
        goto exit;
    }
    //liveview memory init
```

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```
ret = mem_init();
if(ret != HD_OK) {
    printf("mem fail=%d\n", ret);
    goto exit;
}

//liveview module init
ret = init_module();
if(ret != HD_OK) {
    printf("init fail=%d\n", ret);
    goto exit;
}

//open liveview module
ret = open_module(&liveview,out_type);
if(ret != HD_OK) {
    printf("open fail=%d\n", ret);
    goto exit;
}

//get videocap capability
ret = get_cap_syscaps(liveview.cap_ctrl,&liveview.cap_syscaps);
if (ret != HD_OK) {
    printf("get cap-caps fail=%d\n", ret);
    return HD_ERR_NG;
}

//get videoout capability
ret = get_out_syscaps(liveview.out_ctrl,&liveview.out_syscaps);
if (ret != HD_OK) {
    printf("get out-caps fail=%d\n", ret);
    return HD_ERR_NG;
}

//get videocap parameter
ret = set_cap_param(liveview.cap_path,&liveview.dim);
if (ret != HD_OK) {
    printf("set cap fail=%d\n", ret);
    return -1;
}

//set videoproc parameter
ret = set_proc_param(liveview.proc_path);
```

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```
if (ret != HD_OK) {
    printf("set proc fail=%d\n", ret);
    return -1;
}

//set videoout parameter
ret = set_out_param(liveview.out_path,&liveview.out_syscaps.output_dim);
if (ret != HD_OK) {
    printf("set out fail=%d\n", ret);
    return -1;
}

//bind liveview module
hd_videocap_bind(HD_VIDEOCAP_0_OUT_0, HD_VIDEOPROC_0_IN_0);
hd_videoproc_bind(HD_VIDEOPROC_0_OUT_0, HD_VIDEOOUT_0_IN_0);
//start liveview module
hd_videocap_start(liveview.cap_path);
hd_videoproc_start(liveview.proc_path);
hd_videoout_start(liveview.out_path);

printf("Enter q to exit\n");
while (1) {
    key = getchar();
    if (key == 'q' || key == 0x3) {
        break;
    }

    #if (DEBUG_MENU == 1)
    if (key == 'd') {
        hd_debug_run_menu(); // call debug menu
        printf("\r\nEnter q to exit, Enter d to debug\r\n");
    }
    #endif
}

//stop liveview module
hd_videocap_stop(liveview.cap_path);
hd_videoproc_stop(liveview.proc_path);
hd_videoout_stop(liveview.out_path);

//unbind liveview module
```

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```
hd_videocap_unbind(HD_VIDEOCAP_0_OUT_0);
hd_videoproc_unbind(HD_VIDEOPROC_0_OUT_0);

exit:
    //close all module
    ret = close_module(&liveview);
    if(ret != HD_OK) {
        printf("close fail=%d\n", ret);
    }
    //uninit all module
    ret = exit_module();
    if(ret != HD_OK) {
        printf("exit fail=%d\n", ret);
    }
    //uninit memory
    ret = mem_exit();
    if(ret != HD_OK) {
        printf("mem fail=%d\n", ret);
    }
    //uninit hda1
    ret = hd_common_uninit();
    if(ret != HD_OK) {
        printf("common fail=%d\n", ret);
    }

    return 0;
}
```

5 Frequently asked questions

5.1 [NVR ONLY]

5.1.1 Display capture output dim

1920x1080 capture in 4K2K monitor case, capture out dim can't over 1920x1080, user need just set capture out dim to 1920x1080, let vpe to scaling up to 4K2K and paste to lcd buffer.

5.1.2 ClearWin

User can use "HD_ACTIVE_IMMEDIATELY" mode to clear monitor region if not change the division, otherwise set clearwin in "HD_ACTIVE_BY_APPLY" mode first then change the division.

5.1.3 Write back and clearwin

User need stop hdmi write data to cvbs then do clear cvbs buffer ,otherwise the clear buffer will be write by hdmi.

5.2 [IPCAM ONLY]

5.2.1 HD_FB_ID

Each display device has a separate FB layer, starting with FB0. IPCAM has only one layer of FB, so only FB0 is supported.

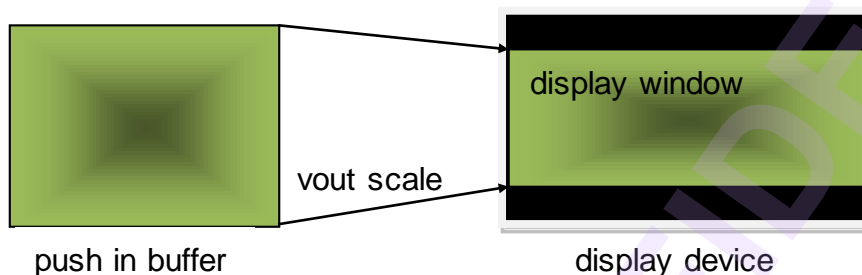
5.2.2 Bind vout

There is no support for the two path bind vout function. For PIP (picture in picture)

function, the user must first combine the two video frames and then push in to vout.

5.2.3 Driver error message

idec_set_video_win_attr_ex:Horizontal Scaling down ratio over 2! This message indicates that the vout input buffer is twice as wide as the vout window. vout cannot scale down. Users should check HD_VIDEOOUT_PARAM_IN and HD_VIDEOOUT_PARAM_IN_WIN_ATTR setting. Default vout window is device size.



- vout scale quality is not as good as vproc, it is recommended to push buffer with vproc scale and then push in to vout

5.2.4 Rotate buffer

When rotating the screen, it is recommended to set the in buffer width and height exchange to avoid vout scale. vout flow will rotate first, then set the buffer to the display. If it is rotated, the width and height are not the same as the display window, it will scale

6 Q&A

1. Can an osd image shared between videoprocess, videoenc and videoout?
 - Yes : Just set the same p_addr value of HD_OSG_STAMP_BUF to videoprocess, videoenc and videoout pathid.
 - Subsequent upate through any pathid with automatically reflect on other pathid
2. Any constrain on osg image and buffer?
 - Width of an image is best to be 4 aligned
 - Height of an image is best to be 2 aligned

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- Buffer address is best to be 128 aligned
3. Any advice on osg number?
- It's hard to say. System with heavy loading has less margin for ex stamp and mask
 - For a 30fps system, 4 ex stamps or 4 ex masks are safe
4. How to set alpha for an osg image
- This is conditional to image formats
 - Alpha of argb4444 is completely determined by pixel's 4-bits alpha value
 - Alpha of argb1555 is determined by pixel's 1-bit alpha value and the alpha field of HD_OSG_STAMP_ATTR. If pixel's alpha value is 0, bits 3 ~ bits 0 of HD_OSG_STAMP_ATTR's alpha field determines transparency. If pixel's alpha value is 1, bits 7 ~ bits 4 of HD_OSG_STAMP_ATTR's alpha field determines transparency
 - Alpha of rgb565 is completely determined by the alpha field of HD_OSG_STAMP_ATTR.
5. If an osg is configured with ping pong buffer. Is it possible to directly draw the free buffer?
- Yes
 - Use HD_VIDEOOUT_PARAM_OUT_STAMP_IMG to get the physical address of the free buffer
 - Draw this free buffer
 - Apply the drawing by set HD_VIDEOOUT_PARAM_OUT_STAMP_IMG. The p_addr field of HD_OSG_STAMP_IMG should be the same physical address.