B3VCU software resource specification

Revision History

Name	Date	Reason For Changes	Version
Chen Yong	May 14, 2022	Initial draft	1.0.1
Chen Yong	Aug 3, 2022	Modify by VCU_IDS_V0.2.xlsx requirement	1.0.2
Chen Yong	Aug 17, 2022	Modify by VDU Software V0.5_16082022.pptx	1.0.3
Chen Yong	Aug 14, 2023	Append Version Control list	1.0.4

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2 Referenced documents

3 Requirements

3.1 Required states and modes

3.1.1 verbose information mode

Run application with option '-v', then it will enter into the print verbose information mode. It will print out the verbose information of the VCU and exit.

The verbose information includes: the device info, the configuration data, the error recording data and the working information data.

- The device info:(refer 3.5.2)

Main Version:x.x.x (the whole system version)

App Version:x.x.x (the firmware version)

OSD Variant:xxxx(the VDU OSD variant)

SN:B3VCU-xxx (the VCU serial Number)

date:xx-xx-xxxx (manufacturing date)

- The Configuration data: (refer 3.5.1)

Configuration: tick=xxxxx (the total power on time. unit(s))

- the error recording data:(refer 3.5.1)

Recording:

timestamp=xxxxx info=0xhhhhhhhh desc=xxxxxxxxxxx

....

-------Over----------

- the working information data:(refer 3.4.6)

Power Current: raw=xxx.xxx scale=x.xxx current=x.xxxx

PS temp:raw=xxx.xxx scale=x.xxx offset=xxx.xxx temp=xx.xxx

3.1.2 Normal working mode

Defaut system booting up, the application will run in this normal working mode. The system script file is in /*etc*/init.d/loaduserapp.sh.

It has a configuration file. The default configuration file is /*etc*/b3vcu.conf. It can be assign a special configuration file by option(-f filename). The configuration file data format refer to 3.5.2

3.2 CSCI capability requirements

3.2.1 Booting up

The maxium system booting up time is less than 30 seconds.

3.2.2 Watchdog enable

Enable watchdog and the application refresh the watchdog timer. The watchdog can restart the system if the application cannot refresh the watchdog.

3.2.3 Video Error monitor

Keep monitoring the video input. Disable the SDI output if any error in the video input is found.

3.3 CSCI external interface requirements

3.3.1 CAM UART

***Format**: RS422*

***Device name**: /dev/ttySC0*

***working mode**:Duplex*

***data**: 115200n8*

***flow control**: no*

The “NUC” command output to camera.

Protocol refer to document (TSP-545-AJ-0014-C_23Oct19.pdf) provided by STK

3.3.2 VDU UART

***Format**: RS422*

***Device name**: /dev/ttySC1*

***working mode**:Duplex*

***data**: 115200n8*

***flow control**: no*

Receiving “Key” information from VDU and reponse it.

Protocol refer to document (Serial Protocol) provided by Teamone

3.3.3 SPARE UART

***Format**: RS232*

***Device name**: /dev/ttyPS1, /dev/ttySC2, /dev/ttySC3*

***working mode**:Duplex*

***data**: 115200n8*

***flow control**: no*

3.3.4 Ethernet

1**0/100/1000 BASE-T**

- **Port 1(eth2):** VCU control port static IP 192.168.1.254 port 51000
- **Port 2(eth0):** VCU RTP video stream port. Static IP 192.168.6.254
- **Port 3(eth1):** VCU RTP video stream port. Static IP 192.168.7.254

RTP Video Stream:

To Host IP: Port 2: 192.168.6.255 Port 3: 192.168.7.255

To Host port 5001: Video Input 0

To Host port 5002: Video Input 1

To Host port 5003: Video Input 2

To Host port 5004: Video Input 3

To Host port 5005: Video Input 4

To Host port 5006: Video Input 5

To Host port 5007: Video Input 6

To Host port 5008: Video Input 7

To Host port 5009: Video Input 8

To Host port 5010: Video Input 9

Format: UDP /RTP

clock rate: 90000

encoding name:H264

payload:96

Control:

Protocol Refer to document(VCU_IDS_V0.3.xlsx)

3.3.5 KeyPad

Key No	Gpio port	Key name	Linux code	
KEY_DIN_1	<axi_gpio_0 0>	key1	KEY_1(2)	Trailer ?
KEY_DIN_2	<axi_gpio_0 1>	key2	KEY_2(3)	Reverse Gear
KEY_DIN_3	<axi_gpio_0 2>	key3	KEY_3(4)	Forward Gear
KEY_DIN_4	<axi_gpio_0 3>	key4	KEY_4(5)	TBD
KEY_DIN_5	<axi_gpio_0 4>	key5	KEY_5(6)	TBD
KEY_DIN_6	<axi_gpio_0 5>	key6	KEY_6(7)	TBD
KEY_DIN_7	<axi_gpio_0 6>	key7	KEY_7(8)	TBD
KEY_DIN_8	<axi_gpio_0 7>	key8	KEY_8(9)	TBD

3.3.6 Digital GPIO Output

DO No	Linux GPIO No	Terminal	Description
DO1	492	IR	On/OFF IR
DO2	493	IR	On/OFF IR
DO3	494	TBD	
DO4	495	TBD	
DO5	496	TBD	

3.3.7 SDI Video Input

Device name: /*dev/media6 (/dev/video0)*

/dev/media7 (/dev/video1)

/dev/media8 (/dev/video2)

/dev/media9 (/dev/video3)

/dev/media0 (/dev/video4)

/dev/media1 (/dev/video5)

/dev/media2 (/dev/video6)

/dev/media3 (/dev/video7)

/dev/media4 (/dev/video8)

/dev/media5 (/dev/video9)

***SDI0-SDI3 support format**: 1080P60 or lower resolution.*

***SDI4-SDI9 support format**: 1080P30*

3.3.8 *SDI Video Output*

SDI0 output: frmbuf_rd --> mix -> uhdsdi_tx (‘mix’ can mix video and osd)

SDI1 – SDI7 output: frmbuf_rd->udhsdi_tx. (without osd funciton)

There is a device “sdi_anc_tx” in all output. It can embed timestamp into the SDI signal.

all devices refer to internal interface:

frmbuf_rd: refer to 3.4.2

mix: refer to 3.4.3

uhdsdi_tx: refer to 3.4.4

sdi_anc_tx: refer to 3.4.5

3.3.9 LED

LED	Linux GPIO No	Description
Green	458	Normal Status
Red	459	BIT error

3.4 CSCI internal interface requirements

3.4.1 I2C

device name: /*dev*/i2c-0

slave chip: mb85rc256vfp **slave address**: 0x50

description: log data storage

3.4.2 frmbuf_rd

Address: sdi0(0xb02d0000) sdi1(0xb02f0000) sdi2(0xb0310000) sdi3(0xb0330000) sdi4(0xb03a0000) sdi5(0xb03c0000) sdi6(0xb03e0000) sdi7(0xb0400000)

Support Format: Y_UV10, Y_UV8

refer to document (pg278-v-frmbuf.pd) provided by Xilinx

3.4.3 mix

Address: 0xb02e0000

Primary video format: YUV4:2:2 10bits

Overlay layer1 format: BGRA8

Maximum resolution: 1920x1080

refer to doucument (pg243-v-mix.pdf) provided by Xilinx

3.4.4 uhdsdi_tx

Address: sdi0(0xa0040000) sdi1(0xa0060000) sdi2(0xa0080000) sdi3(0xa00a0000) sdi4(0xa0100000) sdi5(0xa0120000) sdi6(0xa0140000) sdi7(0xa0160000)

Mode: 3G SDI 10bits

format: NV16_10LE32

refer to document (pg289-v-smpte-uhdsdi-tx-ss.pdf) provided by Xilinx

3.4.5 sdi_anc_tx

Address: sdi0(0xa01c0000) sdi1(0xa01d0000) sdi2(0xa01e0000) sdi3(0xa01f0000) sdi4(0xa0200000) sdi5(0xa0210000) sdi6(0xa0220000) sdi7(0xa0230000)

data format: 64bits unsigned interger. Microseconds of the epoch time.

3.4.6 iio sensor

CPU:/sys/bus/iio/devices/iio\:device0

Power Current Sensor:/sys/bus/iio/devices/iio\:device1

3.4.7 pdma

It is a user interface to transfer a DAM address of the user space to the physical address.

Device: /*dev*/pdma0

ioctl cmd: 0

ioctl parameters: struct{guint64 param_in; guint64 param_out}

param_in: the dma user-space address.

param_out: the dma physical address

3.4.8 Reserv memory

Osd reserve memory physcial address:0x70000000

osd reserve memory size: 0xff00000

osd image format: ARGB32

3.4.9 Watchdog

Device: */dev/watchdog0, /dev/watchdog1*

watchdog0 is controlled by OS.

Watchdog1 can be controoled by the user.

3.5 CSCI internal data requirements

3.5.1 Log data

Log data is stored in the Log FRAM chip. It includes two configuration data structrue and the error recording data array. The error recording data array can fill the space of the log chip except the configuration data area.

conf[2] (logdata_conf_data_t)	header (guint32)	0x5555aaaa	Configuration data header ID
	timestamp (guint32)		Linux epoch time(unit:s)
	totaltick (guint32)		Totoal power on time(unit:s)
	rev[2] (guint16)		Reserve data space
	chk (guint16)		CRC16 checksum(modbus)
rec[] (logdata_rec_data_t)	header (guint32)	0x66669999	Recording data header ID
	timestamp (guint32)		Linux epoch time(unit:s)
	infocode (guint32)		0x80000001: memory error 0x80000002:temperature error 0x80000003:power error 0x80010001:log chip error 0x80010002:sensor error 0x80010003:key error 0x80010004:sdi device error 0x80010005:sdi out device error 0x80010006:osd device error 0x80010007:serial device error
	desc[34] (guint8)		Error info description
	chk (guin16)		CRC16 checksum(modbus)

3.5.2 Configuration file data

Default Configuration file: */etc/b3vdu.conf*

file data format based on "libconfig"

Item	Type	Value	descritpion
device.version	String	"x.x.x"	Whole system version
device.SN	String	"B3VCU-xxx"	Device Serial Number
device.date	String	"xx-xx-xxxx"	Manufacturing Date
VARIANT	String	"xxxxxx"	VDU OSD variant
BITMASK	HEX(32 bits)	0xhhhhhhhh	Error bit mask for light 0:disable 1: enable
DISABEL_WATCHDOG	Boolean	true: disable watchdog false: enable watchdog	Firmware watchdog enable/disable
DISABLE_SEI	Boolean	true: disable SEI package	SEI package of

		false: enable SEI package	RTP/UDP streamer data
MaxRtpStream	Integer	1 – 8	The maximum rtp streams can be enable.

3.5.3 global parameters

PGParam (glb_priv_data_t)	Sysbits (guint32)	Bit0: memory bit1: logdata bit2: snsor bit3: current bit4: temperature bit5: keypad bit6: video out0 bit7: video out1 bit8: video out2 bit9: video out3 bit10: video out4 bit11: video out5 bit12: video out6 bit13: video out7 bit14: vdieo in0 bit15: video in1 bit16: video in2 bit17: video in3 bit18: video in4 bit19: video in5 bit20: video in6 bit21: video in7 bit22: video in8 bit23: video in9 bit24: osd bit25: serial bit26: vdu	System BIT information: 0: pass 1: fail

4 Requirements traceability

5 Note

6 Appendixes

6.1 Version Log

Vesrion	**Date**	**content**
1.0.1	29 Jun 2022	inital version
1.0.2	14 Jul 2022	NUC camera command and show 'NUC' information based on STK document "VDU View Switching 13072022.pptx"
1.1.1	20 Jul 2022	net communication protocol based on STK document "VCU_IDS_V0.2.xlsx"
1.1.2	27 Jul 2022	enable 8 stream out among all 10 SDI input.
1.1.3	11 Aug 2022	Modify OSD base on STK document "VDU View Switching 25072022.pptx"
1.1.4	17 Aug 2022	Modify OSD base on STK document "VDU Software V0.5_16082022.pptx"
1.1.5	21 Sep 2022	IR on/off status shown by VDU not VCU. based on STK document "VDU Software V0.6_20092022.pptx"
1.1.6	4 Oct 2022	Add all bytes as checksum based on "tcp protocol" of "VCU_IDS_V0.3.xlsx"
1.1.7	1 Nov 2022	request VDU system information and send to Host based on STK document "VCU_IDS_V0.4.xlsx"
1.1.8	15 Nov 2022	red led flashing based on "VDU Software V0.7_31102022.pptx"
1.1.9	15 Dec 2022	Red Led will not flashing. Only detect 3 HD-SDI input in BIT.
1.1.10	3 Jan 2023	Downgrade Video Ethernet stream 30fps to 15fps base on STK document.
1.1.11	7 Feb 2023	print application information with syslog. Change NUC protocol base on STK document "VDU Software V0.8_06022023.pptx".
1.1.12	17 Feb 2023	change camera RS422 baudrate from 115200 to 38400 base on STK document "VDU Software V0.9_16022023.pptx"
1.1.13	27 Apr 2023	change Fault light mode based on "VDU Software V0.10_27042023.pptx" change network protocol based on "VCU_IDS_V0.6.xlsx"
1.1.14	8 Jun 2023	Remove downgrade fps module. Downgrade streams number to

		4 and upgrade to low-latency mode. baed on STK document "VDU Software V0.12_08072023.pptx"