INGENIC®

T31 bitrate control instruction

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T31 bitrate control instruction

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Release history

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June.2021	1.0	First release

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Content

1   Usage of the rate control parameters

There are five T31 bitrate control methods: FIXQP constant quantization parameter mode, CBR constant bitrate mode, VBR variable bitrate mode, CAPPED_VBR variable bitrate mode based on the target PSNR value, CAPPED_QUALITY based on CAPPED_VBR added to solve the bitrate under severe exercise Variable bitrate mode for the phenomenon of low rate.

1.1   Significance and Usage of CBR parameters

Parameters	Description	Scenes	Remarks
uTargetBitRate	Target BitRate	Skip	Unit Kbit/s
iInitialQP	Min qp	Limit the best image quality. When QP is adjusted to this value, it will not be adjusted further, which may result in insufficient bit rate; It is mainly used to save bitrate in simple static scenes	suggested value [10,34]
iMinQP	Max qp	Limit the worst image quality. When QP is adjusted to this value, it will not be adjusted upwards, which may cause bit rate upsurge. Set 51 for scenes that focus on bitrate, and set scenes that focus on quality as needed.	suggested value [45,51]

iMaxQP	Max qp	Limit the worst image quality. When QP is adjusted to this value, it will not be adjusted upwards, which may cause bit rate upsurge. Set 51 for scenes that focus on bitrate, and set scenes that focus on quality as needed.	suggested value [45,51]
iIPDelta	Specify the qp difference between I frame and P frame	Skip	suggested value -1
iPBDelta	Specify the qp difference between P frame and B frame	Skip	suggested value -1
eRcOptions	Additional options for rate control	Skip	Recommend to use default parameters
uMaxPictureSize	The maximum size of an image	Used to limit the maximum bitstream size after encoding one frame, it is recommended to set it to uTargetBitRate* 4/3 size	Unit Kbit/s, setting too small may cause image quality problems, such as breathing effect

1.2 Significance and Usage of CAPPED_VBR parameters

Parameters	Description	Scenes	Remarks
uTargetBitRate	Target BitRate	Skip	Skip
uMaxBitRate	MaxBitRate	Skip	Skip
iInitialQP	Initial qp	Skip	Skip
iMinQP	Min qp	Consistent with cbr	Consistent with cbr
iMaxQP	Max qp	Consistent with cbr	Consistent with cbr

iIPDelta	QP difference between I frame and P frame	Consistent with cbr	Consistent with cbr
iPBDelta	QP difference between P frame and B frame	Consistent with cbr	Consistent with cbr
eRcOptions	Additional options for rate control	Skip	Consistent with cbr
uMaxPictureSize	The maximum size of an image	Used to limit the maximum bitstream size after encoding one frame, it is recommended to set it to uTargetBitRate* 4/3 size	Unit Kbit/s, setting too small may cause image quality problems, such as breathing effect

1.3 Significance and Usage of CAPPED_VBR parameters

Parameters	Description	Scenes	Remarks
uTargetBitRate	Target BitRate	Skip	Skip
uMaxBitRate	MaxBitRate	Skip	Skip
iInitialQP	Initial qp	Consistent with cbr	Consistent with cbr
iMinQP	Min qp	Consistent with cbr	Consistent with cbr
iMaxQP	Max qp	Consistent with cbr	Consistent with cbr
iIPDelta	QP difference between I frame and P frame	Consistent with cbr	Consistent with cbr
iPBDelta	QP difference between P frame and B frame	Consistent with cbr	Consistent with cbr
eRcOptions	Additional options For rate control	Skip	Consistent with cbr
uMaxPictureSize	Image maximum size	Consistent with vbr	Consistent with vbr

uMaxPSNR	The largest image psnr	Need to limit the best image quality scenes	Recommend to use default parameters

1.4 Significance and Usage of CAPPED_QUALITY parameters

Parameters	Description	Scenes	Remarks
uTargetBitRate	Target BitRate	Skip	Skip
uMaxBitRate	MaxBitRate	Skip	Skip
iInitialQP	Initial qp	Consistent with cbr	Consistent with cbr
iMinQP	Min qp	Consistent with cbr	Consistent with cbr
iMaxQP	Max qp	Consistent with cbr	Consistent with cbr
iIPDelta	QP difference between I frame and P frame	Consistent with cbr	Consistent with cbr
iPBDelta	QP difference between P frame and B frame	Consistent with cbr	Consistent with cbr
eRcOptions	Additional options For rate control	Consistent with cbr	Consistent with cbr
uMaxPictureSize	Image maximum size	Consistent with vbr	Consistent with vbr
uMaxPSNR	The largest image psnr	Consistent with capped_vbr	Consistent with capped_vbr

1.5 Significance and Usage of FIXQP parameters

Parameters	Description	Scenes	Remarks

iInitialQP	Initial qp	The way to use constant qp encoding	Skip

1.6 Significance and Usage of GOP and frame rate parameters

Parameters	Description	Scenes	Remarks
frmRateNum	Frame rate numerator	Skip	Skip
frmRateDen	Frame rate denominator	Skip	Skip
uGopCtrlMode	Gop Control mode	Only supports IMP_ENC_GOP_CTRL _MODE_DEFAULT	Skip
uGopLength	Gop Length	Skip	Skip
uNotifyUserLTInter	Use long reference frame spacing	Use after enabling long reference frames	Skip
uMaxSameSenceCnt	Maximum number of the same scenarios	This value is the I frame interval multiplied by the uGopLength length	Skip
bEnableLT	Enable long-term reference frame	Most cases are static scenarios	Skip
uFreqLT	Specify the long-term parameter frame interval	Skip	Skip
bLTRC	Specify a long-term reference frame as a candidate reference frame	Skip	Skip

2   Recommended bit rate control settings

For the exact value, please call impdbg --enc_info during the sample-Encode-video process. The following uses 1080p and 360p resolutions as examples to provide recommended default values.

2.1 Module product's recommended settings of birate

[root@Ingenic-uc1_1:~]# impdbg --enc_info

GROUP 0

      CHANNEL 0   1920x 1080   START H265 tf:19   df:0

encdur:749, encodingFrameCnt:19,endencodeFrameCnt=19,endrelaseFrameCnt=19

----

ch->index = 0

chnAttr->encAttr->eProfile = 16777217(0x1000001) offset:size = 0:4

chnAttr->encAttr->uLevel = 50(0x32) offset:size = 4:1

chnAttr->encAttr->uTier = 1(0x1) offset:size = 5:1

chnAttr->encAttr->uWidth = 1920(0x780) offset:size = 6:2

chnAttr->encAttr->uHeight = 1080(0x438) offset:size = 8:2

chnAttr->encAttr->ePicFormat = 392(0x188) offset:size = 12:4

chnAttr->encAttr->eEncOptions = 262184(0x40028) offset:size = 16:4

chnAttr->encAttr->eEncTools = 156(0x9c) offset:size = 20:4

chnAttr->rcAttr->rcMode = 4(0x4) offset:size = 44:4

chnAttr->rcAttr->CappedVbr->uTargetBitRate = 1352(0x548) offset:size = 48:4

chnAttr->rcAttr->CappedVbr->uMaxBitRate = 1802(0x70a) offset:size = 52:4

chnAttr->rcAttr->CappedVbr->iInitialQP = -1(0xffffffff) offset:size = 56:2

chnAttr->rcAttr->CappedVbr->iMinQP = 20(0x14) offset:size = 58:2

chnAttr->rcAttr->CappedVbr->iMaxQP = 45(0x2d) offset:size = 60:2

chnAttr->rcAttr->CappedVbr->iIPDelta = -1(0xffffffff) offset:size = 62:2

chnAttr->rcAttr->CappedVbr->iPBDelta = -1(0xffffffff) offset:size = 64:2

chnAttr->rcAttr->CappedVbr->eRcOptions = 17(0x11) offset:size = 68:4

chnAttr->rcAttr->CappedVbr->uMaxPictureSize = 1802(0x70a) offset:size = 72:4

chnAttr->rcAttr->CappedVbr->uMaxPSNR = 42(0x2a) offset:size = 76:2

chnAttr->rcAttr->outFrmRate->frmRateNum = 25(0x19) offset:size = 80:4

chnAttr->rcAttr->outFrmRate->frmRateDen = 1(0x1) offset:size = 84:4

chnAttr->gopAttr->uGopCtrlMode = 2(0x2) offset:size = 88:4

chnAttr->gopAttr->uGopLength = 50(0x32) offset:size = 92:2

chnAttr->gopAttr-> uNotifyUserLTInter = 0(0x0) offset:size = 94:1

chnAttr->gopAttr->uMaxSameSenceCnt = 2(0x2) offset:size = 96:4

chnAttr->gopAttr->bEnableLT = 0(0x0) offset:size = 100:1

chnAttr->gopAttr->uFreqLT = 0(0x0) offset:size = 104:4

chnAttr->gopAttr->bLTRC = 0(0x0) offset:size = 108:1

GROUP 3

CHANNEL 3   640x   360   START H265 tf:19   df:0

encdur:750, encodingFrameCnt:19,endencodeFrameCnt=19,endrelaseFrameCnt=19

----

ch->index = 3

chnAttr->encAttr->eProfile = 16777217(0x1000001) offset:size = 0:4

chnAttr->encAttr->uLevel = 50(0x32) offset:size = 4:1

chnAttr->encAttr->uTier = 1(0x1) offset:size = 5:1

chnAttr->encAttr->uWidth = 640(0x280) offset:size = 6:2

chnAttr->encAttr->uHeight = 360(0x168) offset:size = 8:2

chnAttr->encAttr->ePicFormat = 392(0x188) offset:size = 12:4

chnAttr->encAttr->eEncOptions = 262184(0x40028) offset:size = 16:4

chnAttr->encAttr->eEncTools = 156(0x9c) offset:size = 20:4

chnAttr->rcAttr->rcMode = 4(0x4) offset:size = 44:4

chnAttr->rcAttr->CappedVbr->uTargetBitRate = 624(0x270) offset:size = 48:4

chnAttr->rcAttr->CappedVbr->uMaxBitRate = 832(0x340) offset:size = 52:4

chnAttr->rcAttr->CappedVbr->iInitialQP = -1(0xffffffff) offset:size = 56:2

chnAttr->rcAttr->CappedVbr->iMinQP = 20(0x14) offset:size = 58:2

chnAttr->rcAttr->CappedVbr->iMaxQP = 45(0x2d) offset:size = 60:2

chnAttr->rcAttr->CappedVbr->iIPDelta = -1(0xffffffff) offset:size = 62:2

chnAttr->rcAttr->CappedVbr->iPBDelta = -1(0xffffffff) offset:size = 64:2

chnAttr->rcAttr->CappedVbr->eRcOptions = 17(0x11) offset:size = 68:4

chnAttr->rcAttr->CappedVbr->uMaxPictureSize = 832(0x340) offset:size = 72:4

chnAttr->rcAttr->CappedVbr->uMaxPSNR = 42(0x2a) offset:size = 76:2

chnAttr->rcAttr->outFrmRate->frmRateNum = 25(0x19) offset:size = 80:4

chnAttr->rcAttr->outFrmRate->frmRateDen = 1(0x1) offset:size = 84:4

chnAttr->gopAttr->uGopCtrlMode = 2(0x2) offset:size = 88:4

chnAttr->gopAttr->uGopLength = 50(0x32) offset:size = 92:2

chnAttr->gopAttr-> uNotifyUserLTInter = 0(0x0) offset:size = 94:1

chnAttr->gopAttr->uMaxSameSenceCnt = 2(0x2) offset:size = 96:4

chnAttr->gopAttr->bEnableLT = 0(0x0) offset:size = 100:1

chnAttr->gopAttr->uFreqLT = 0(0x0) offset:size = 104:4

chnAttr->gopAttr->bLTRC = 0(0x0) offset:size = 108:1

2.2 WIFI product's recommended settings of bitrate

[root@Ingenic-uc1_1:mnt]# impdbg --enc_info

GROUP 0

      CHANNEL 0   1920x 1080   START H265 tf:4   df:0

encdur:166, encodingFrameCnt:4,endencodeFrameCnt=4,endrelaseFrameCnt=4

----

ch->index = 0

chnAttr->encAttr->eProfile = 16777217(0x1000001) offset:size = 0:4

chnAttr->encAttr->uLevel = 50(0x32) offset:size = 4:1

chnAttr->encAttr->uTier = 1(0x1) offset:size = 5:1

chnAttr->encAttr->uWidth = 1920(0x780) offset:size = 6:2

chnAttr->encAttr->uHeight = 1080(0x438) offset:size = 8:2

chnAttr->encAttr->ePicFormat = 392(0x188) offset:size = 12:4

chnAttr->encAttr->eEncOptions = 262184(0x40028) offset:size = 16:4

chnAttr->encAttr->eEncTools = 156(0x9c) offset:size = 20:4

chnAttr->rcAttr->rcMode = 4(0x4) offset:size = 44:4

chnAttr->rcAttr->CappedVbr->uTargetBitRate = 676(0x2a4) offset:size = 48:4

chnAttr->rcAttr->CappedVbr->uMaxBitRate = 901(0x385) offset:size = 52:4

chnAttr->rcAttr->CappedVbr->iInitialQP = -1(0xffffffff) offset:size = 56:2

chnAttr->rcAttr->CappedVbr->iMinQP = 34(0x22) offset:size = 58:2

chnAttr->rcAttr->CappedVbr->iMaxQP = 51(0x33) offset:size = 60:2

chnAttr->rcAttr->CappedVbr->iIPDelta = -1(0xffffffff) offset:size = 62:2

chnAttr->rcAttr->CappedVbr->iPBDelta = -1(0xffffffff) offset:size = 64:2

chnAttr->rcAttr->CappedVbr->eRcOptions = 17(0x11) offset:size = 68:4

chnAttr->rcAttr->CappedVbr->uMaxPictureSize = 901(0x385) offset:size = 72:4

chnAttr->rcAttr->CappedVbr->uMaxPSNR = 42(0x2a) offset:size = 76:2

chnAttr->rcAttr->outFrmRate->frmRateNum = 25(0x19) offset:size = 80:4

chnAttr->rcAttr->outFrmRate->frmRateDen = 1(0x1) offset:size = 84:4

chnAttr->gopAttr->uGopCtrlMode = 2(0x2) offset:size = 88:4

chnAttr->gopAttr->uGopLength = 50(0x32) offset:size = 92:2

chnAttr->gopAttr-> uNotifyUserLTInter = 0(0x0) offset:size = 94:1

chnAttr->gopAttr->uMaxSameSenceCnt = 2(0x2) offset:size = 96:4

chnAttr->gopAttr->bEnableLT = 0(0x0) offset:size = 100:1

chnAttr->gopAttr->uFreqLT = 0(0x0) offset:size = 104:4

chnAttr->gopAttr->bLTRC = 0(0x0) offset:size = 108:1

GROUP 3

     CHANNEL 3   640x   360   START H265 tf:4   df:0

encdur:167, encodingFrameCnt:4,endencodeFrameCnt=4,endrelaseFrameCnt=4

----

ch->index = 3

chnAttr->encAttr->eProfile = 16777217(0x1000001) offset:size = 0:4

chnAttr->encAttr->uLevel = 50(0x32) offset:size = 4:1

chnAttr->encAttr->uTier = 1(0x1) offset:size = 5:1

chnAttr->encAttr->uWidth = 640(0x280) offset:size = 6:2

chnAttr->encAttr->uHeight = 360(0x168) offset:size = 8:2

chnAttr->encAttr->ePicFormat = 392(0x188) offset:size = 12:4

chnAttr->encAttr->eEncOptions = 262184(0x40028) offset:size = 16:4

chnAttr->encAttr->eEncTools = 156(0x9c) offset:size = 20:4

chnAttr->rcAttr->rcMode = 4(0x4) offset:size = 44:4

chnAttr->rcAttr->CappedVbr->uTargetBitRate = 312(0x138) offset:size = 48:4

chnAttr->rcAttr->CappedVbr->uMaxBitRate = 416(0x1a0) offset:size = 52:4

chnAttr->rcAttr->CappedVbr->iInitialQP = -1(0xffffffff) offset:size = 56:2

chnAttr->rcAttr->CappedVbr->iMinQP = 34(0x22) offset:size = 58:2

chnAttr->rcAttr->CappedVbr->iMaxQP = 51(0x33) offset:size = 60:2

chnAttr->rcAttr->CappedVbr->iIPDelta = -1(0xffffffff) offset:size = 62:2

chnAttr->rcAttr->CappedVbr->iPBDelta = -1(0xffffffff) offset:size = 64:2

chnAttr->rcAttr->CappedVbr->eRcOptions = 17(0x11) offset:size = 68:4

chnAttr->rcAttr->CappedVbr->uMaxPictureSize = 416(0x1a0) offset:size = 72:4

chnAttr->rcAttr->CappedVbr->uMaxPSNR = 42(0x2a) offset:size = 76:2

chnAttr->rcAttr->outFrmRate->frmRateNum = 25(0x19) offset:size = 80:4

chnAttr->rcAttr->outFrmRate->frmRateDen = 1(0x1) offset:size = 84:4

chnAttr->gopAttr->uGopCtrlMode = 2(0x2) offset:size = 88:4

chnAttr->gopAttr->uGopLength = 50(0x32) offset:size = 92:2

chnAttr->gopAttr-> uNotifyUserLTInter = 0(0x0) offset:size = 94:1

chnAttr->gopAttr->uMaxSameSenceCnt = 2(0x2) offset:size = 96:4

chnAttr->gopAttr->bEnableLT = 0(0x0) offset:size = 100:1

chnAttr->gopAttr->uFreqLT = 0(0x0) offset:size = 104:4

chnAttr->gopAttr->bLTRC = 0(0x0) offset:size = 108:1

3   Introduce of bitrate control parameters

In case the application layer finds that the transmission is too slow, the frame loss strategy needs to be turned on. Low transmission can happen in situations like:

1) The P2P buffer is full, and a new frame of data stream cannot be put;

2) Need to reset P2P cache;

3) Frame loss during transmission.

The recommended frame loss strategy is:

1)Discard the current frame and subsequent P frames, and calculate the cumulative frame loss count from 0 until the next I frame appears, and set the cumulative frame loss count to 0 to end the frame loss strategy;

2)If the cumulative number of lost frames% frame rate==0, call int IMP_Encoder_RequestIDR(int encChn) to request a new I frame;

3)If no frame is lost and I frame is encountered, the cumulative frame loss count will be set to 0.

4   Bitrate through large processing strategy

When the data stream is too large, you can check from the following ideas to overcome the cause of the data stream.

1) Are uTargetBitRate and uMaxBitRate set too large?

   If so, you can appropriately reduce these two parameters. According to the actual test, the error between the actual data stream and uTargetBitRate is about 5%, except for the case where the scene changes too drastically;

2) Is uMaxPictureSize set to 0?

   In principle, try not to set it to 0. Once it is set to 0, there will be no limit to the actual data stream of one frame;

3) Is the iMaxQP setting too small?

   If it is too small, you can increase iMaxQP appropriately, because the bit rate control will calculate the actual qp according to the target data stream, and iMaxQp does not need to be set too small. If you need better image quality, it is recommended to increase uTargetBitRate appropriately to improve image quality;

4) Is there too much detail in the original image?

   If yes, you need to increase the intensity of noise reduction and reduce the sharpness, especially in outdoor, night vision or low-brightness scenes;

5) Does the scene change too much?

   If yes, you can reduce the AE sensitivity of the ISP module, increase the AE response delay, and avoid frequent adjustments of the AE after the light changes?

5   Scene processing: mosaic or breathing effects

1) Are uTargetBitRate, uMaxBitRate, uMaxPictureSize set too small?

2) Is iMinQp set too large? iMinQp is used for the best image quality of the card position. If the setting is too large, the best image quality will be reduced. You can appropriately reduce iMinQp, because the rate control will calculate the actual qp according to the target data stream, and there is no need to set iMinQp too small. If a smaller target data stream is required, it is recommended to reduce uTargetBitRate appropriately to achieve the purpose of reducing the data stream;

3) Is there too much detail in the original image? Need to increase the intensity of noise reduction and reduce the sharpness, especially in outdoor, night vision or low-brightness scenes;

4) Does the scene change too much? Can reduce the AE sensitivity of the ISP module, increase the AE response delay, and avoid frequent adjustments of the AE after the light changes.

6   Recommend bitrate control:Capped_VBR

The advantage of using Capped_VBR is that it has the advantages of vbr, that is, the data stream is reduced when it is still, and the data stream is increased under the premise that the data stream maintains a certain image quality during movement.

The difference between Capped_VBR and VBR is that when the image quality reaches uMaxPSNR, theoretically, the image quality will not continue to be improved, which can save the data stream;

Capped_VBR is recommended to cooperate with uMaxSameSenceCnt, and the recommended value is 2, which can avoid the jam problem caused by frame loss when the network bandwidth is too low, and can also obtain the benefit of reducing the data stream caused by reducing the number of I frames when the network condition is good.

The difference between Capped_VBR and Capped_Quality is that Capped_Quality is implemented based on Capped_VBR, which can be considered as a cropped version of Capped_VBR. It is used to solve the problem of mosaic caused by too slow convergence speed during the image switching from complex to simple. There are already good measures to deal with this problem, which can handle nearly 99% of the scenes.

7 Reduce the fluctuation of the data stream

It can be achieved by reducing the ratio of uMaxBitRate and uTargetBitRate. The recommended ratio is 4:3 by default. That is to say, uMaxBitRate can be appropriately reduced to overcome the problem that the actual data stream exceeds the target data stream.

This ratio cannot be too small, in order to avoid problems such as breathing effects.

8   Limit the size of the super frame stream size

Setting uMaxPictureSize can limit the size of the maximum encoding frame. It is recommended to set it to uTargetBitRate* 4/3 or uMaxBitRate. Side effect: If the setting is too small, it is easy to produce breathing effect or mosaic.

9   Initial QP assignment method for rate control

The current rate control algorithm contains an empirical algorithm for starting QP. The algorithm selects a typical scene to calculate a suitable starting QP based on the bit rate, resolution, etc., but it cannot obtain an absolutely suitable starting QP value for each scene. If the initial QP is selected too large, the bit rate will be insufficient during the first period of encoding and the image quality will be slightly worse; if the initial QP is selected too small, the bit rate will be exceeded during the first period of encoding. If the customer feels that the empirical value calculated by our algorithm is inappropriate, you can configure the appropriate value by setting iInitialQP, which is set when the channel is created, otherwise it is recommended to use the reference value.

10   Find the problem of insufficient frame rate

To find the problem of insufficient frame rate, you need to determine whether it is ISP frame loss or encoding frame loss;

10.1 Gudged whether the ISP frame rate is insufficient

    1)   Execute "cat /proc/jz/isp/isp-m0" to confirm the current sensor frame rate;

```
[root@Ingenic-uc1_1:~]# cat /proc/jz/isp/isp-m0
***************** ISP INFO *********************
Software Version : H20191206a
SENSOR NAME : gc2053
SENSOR OUTPUT WIDTH : 1920
SENSOR OUTPUT HEIGHT : 1080
ISP OUTPUT FPS : 25 / 1
SENSOR OUTPUT RAW PATTERN : RGGB
ISP Top Value : 0xb5748209
ISP Runing Mode : Day
SENSOR Integration Time : 539 lines
SENSOR Max Integration Time : 1346 lines
SENSOR analog gain : 0
MAX SENSOR analog gain : 217
SENSOR digital gain : 0
MAX SENSOR digital gain : 0
ISP digital gain : 0
MAX ISP digital gain : 64
ISP Tgain DB : 0
```

    2)   Execute "cat /proc/jz/isp/isp-w02; sleep 1; cat /proc/jz/isp/isp-w02;" to calculate whether the difference of the current frame number obtained by executing isp-w02 at 1 second interval is equal to the setting Frame rate.

```
[root@Ingenic-uc1_1:~]#
[root@Ingenic-uc1_1:~]# cat /proc/jz/isp/isp-w02;sleep 1;cat /proc/jz/isp/isp-w02
 391226, 0
0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0
 391251, 0
0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0
[root@Ingenic-uc1_1:~]#
```

10.2 Methods for judging insufficient encoding frame rate

Execute "./impdbg --enc_info;sleep 10;./impdbg --enc_info;" to calculate the difference in the number of dropped frames obtained by executing impdbg at an interval of 10 seconds. This difference divided by 10 is the number of dropped frames per second.

```
[root@Ingenic-uc1_1:mnt]# ./impdbg --enc_info;sleep 10;./impdbg --enc_info
GROUP 0
     CHANNEL 0    1920x 1080    START H265 tf:386980    df:383164    encdur:15490502, encodingFrameCnt=3816,endendcodeFrameCnt=3816,endrelaseFrameCnt=3814
---------------------------------------------
ch->index = 0
chnAttr->encAttr->eProfile = 16777217(0x1000001) offset:size = 0:4
chnAttr->encAttr->uLevel = 50(0x32) offset:size = 4:1
chnAttr->encAttr->uTier = 1(0x1) offset:size = 5:1
chnAttr->encAttr->uWidth = 1920(0x780) offset:size = 6:2
chnAttr->encAttr->uHeight = 1080(0x438) offset:size = 8:2
chnAttr->encAttr->ePicFormat = 392(0x188) offset:size = 12:4
chnAttr->encAttr->eEncOptions = 262184(0x40028) offset:size = 16:4
```

```
GROUP 0
     CHANNEL 0    1920x 1080    START H265 tf:387230    df:383414    encdur:15500521, encodingFrameCnt=3816,endendcodeFrameCnt=3816,endrelaseFrameCnt=3814
---------------------------------------------
ch->index = 0
chnAttr->encAttr->eProfile = 16777217(0x1000001) offset:size = 0:4
chnAttr->encAttr->uLevel = 50(0x32) offset:size = 4:1
chnAttr->encAttr->uTier = 1(0x1) offset:size = 5:1
chnAttr->encAttr->uWidth = 1920(0x780) offset:size = 6:2
chnAttr->encAttr->uHeight = 1080(0x438) offset:size = 8:2
chnAttr->encAttr->ePicFormat = 392(0x188) offset:size = 12:4
chnAttr->encAttr->eEncOptions = 262184(0x40028) offset:size = 16:4
chnAttr->encAttr->eEncTools = 156(0x9c) offset:size = 20:4
```

10.3 Ways to solve insufficient frame rate

1) The solution to encoding frame loss:

   a)   Set a buffer to save the data stream when fetching the data stream. Try not to use the data stream buffer in the SDK for the upper data stream operation, that is, after the data stream is copied to the buffer after getting the stream, the data stream is immediately released to ensure the code of the SDK. The stream buffer is returned to the encoder in time to improve the efficiency of fetching the data stream;

   b)   Use select asynchronous IO, or each encoding channel corresponds to a separate thread dedicated to fetching the data stream.

2) Solution to isp frame loss:

c)   ISP frequency and DDR frequency can be increased to eliminate ISP frame loss caused by slow encoding caused by system efficiency;

d)   Redefine product requirements and reduce the frame rate required by the product.