

MEDIATEK

AE flow

Outline

- **AE introduction**
 - AE-Pline
 - AE update cycle
- **AE class Diagram**
- **AEinit**
- **doPvAE/doPraCapAE**
 - Flow chart
 - Log analysis
- **Trouble shooting**

AE introduction

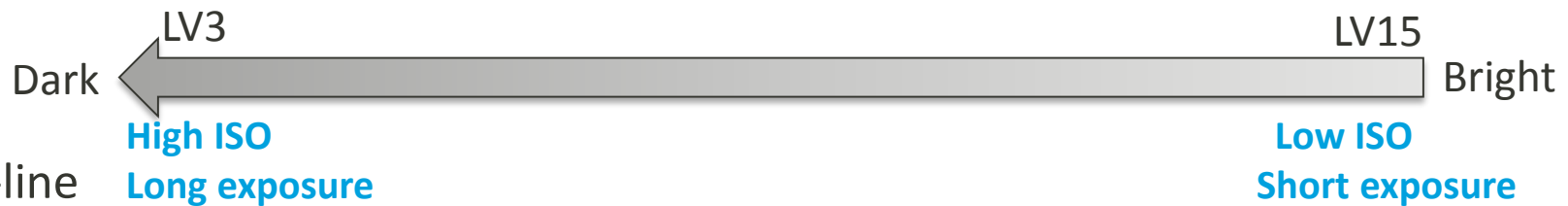
- Purpose :

Automatically calculates and adjusts exposure settings to match with different surrounding luminance

- Method :

- Matching rule (based on APEX function)

Calculate exposure settings that can match specific surrounding luminance



- AE P-line

Contains specific exposure settings for different surrounding luminance

- AE P-line table

Contains specific AE P-line for different scene and sensor modes

Matching Rule

- Exposure settings include : shutter , ISO, F number, luminance
(F number is static for current smart phone sensor module)
- APEX : $AV + TV \neq EV \neq SV + BV$
- AE algorithm decides which TV/SV settings should be used under specific luminance

AV : 光圈值的級數

一般光圈用Fno.表示. Fno.表示光圈直徑開孔的大小的倒數

由於面積 = $\pi \times \text{半徑}^2$ 而光圈每提升一級,代表孔徑縮小一倍, $Fno \times 1.41$,入光量 $\times \frac{1}{2}$

Fno.	1	1.41	2	2.82	4	5.65	8	11.3	16	22.6	32
AV	0	1	2	3	4	5	6	7	8	9	10

TV : 快門值的級數

一般用秒(s)為單位來衡量快門的長短,當快門提升一級,曝光時間 $\times \frac{1}{2}$,入光量 $\times \frac{1}{2}$

S	32s	16s	8s	4s	2s	1s	1/2s	1/4s	1/8s	1/16s	1/32s	1/64s	1/128s
TV	-5	-4	-3	-2	-1	0	1	2	3	4	5	6	7

EV : 光通量的總和.有多少光通過鏡頭到達Sensor.可視為曝光的供給面

$$A_v = \log_2(f^2)$$

$$T_v = \log_2\left(\frac{1}{s}\right)$$

BV : 環境亮度的級數.環境亮度越高,BV越高

SV : Sensor感光度的級數.感光度越高,SV越高

ISO	12.5	25	50	100	200	400	800	1600	3200
SV	2	3	4	5	6	7	8	9	10

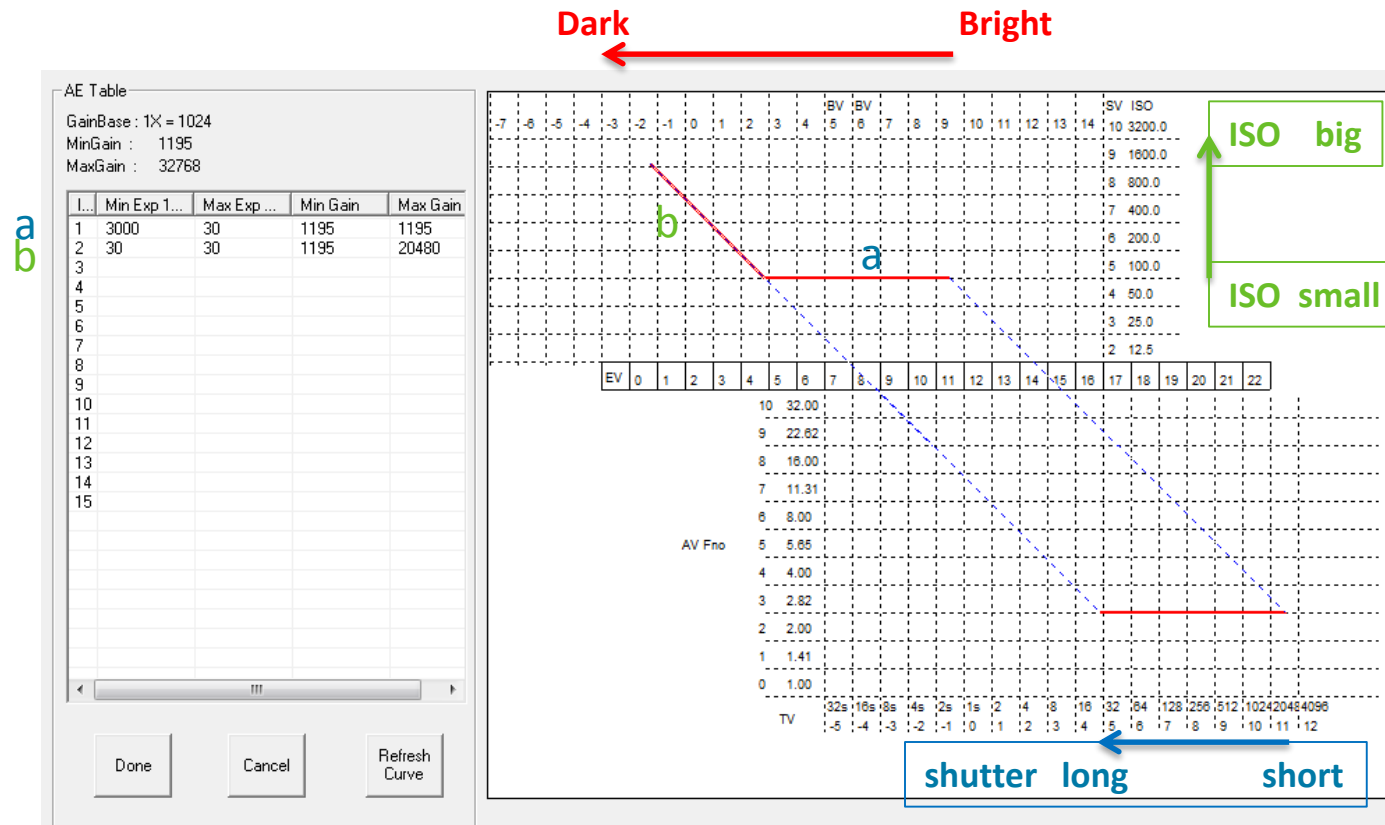
EV : 光需求的總和. 固定的環境亮度及感光度之下,需要多少光通量來讓曝光平衡
可視為曝光的需求面

- e. g.
- 若場景亮度為BV=8, 使用ISO100(SV=5)拍攝時, 光圈與快門組合和(TV+AV)為13即可達成曝光正確
 - 若場景亮度為BV=8, Fno. 為1.8(AV=1.7)拍攝時, 快門與ISO值組合差(AV-SV)為6.2即可達成曝光正確
 - 以上為理論公式, 但真正使用何組TV與SV的決定者在AE algorithm (AE target亦會影響其使用情況)

$$L_v = \log_2\left(\frac{2}{5} \text{lx}\right) \quad S_v = \log_2\left(\frac{I}{3.125}\right) = \log_2(0.32 \times I)$$

AE P-line

- AE P-line contains specific exposure settings for different surrounding luminance
(It records exposure time and ISO from low luminance to high luminance)
- a . When luminance change from BV9 to BV3 → ISO keep 100, Shutter change from 1/2048 to 1/30 (s)
- b . When luminance change from BV3 to BV-1 → Shutter keep 1/30, ISO change from 100 to 1600

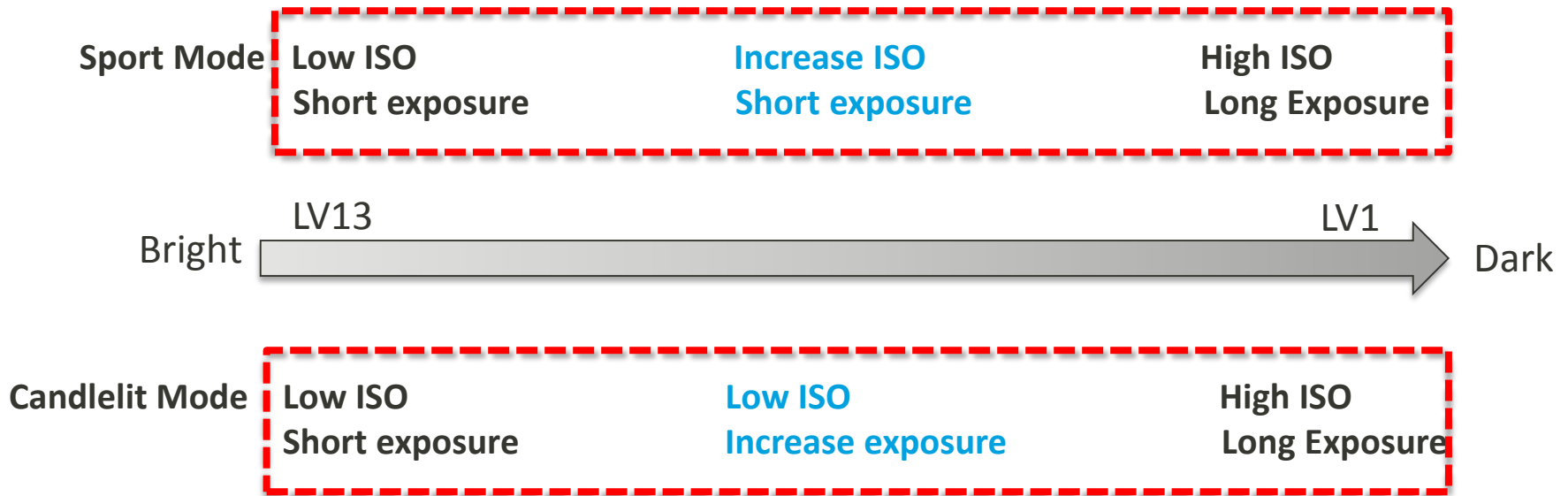


AE P-line table

- AE P-line table:

AE P-line table contains specific AE P-line for different scene modes

e.g. AE P-line in Candlelit mode is different from which in Sport mode



AE P-Line table mapping

Each AE pline mapping table includes : (for customized)

- **Scene Mode**(ex. Auto, Night, Action, Beach, ...)
LIB3A_AE_SCENE_T is defined in *AEPlinetable.h*
- **Sensor mode** (ex. Preview, Capture, Video,...)
- **Flicker mode** (e.g. 50 Hz , 60Hz ,)

Sensor Mode →											
Scene Mode ↓	Prev	Cap	Vid	Vid1	Vid2	Cus1	Cus2	Cus3	Cus4	Cus5	ZSD
Auto	0	1	2	3	4	5	6	7	8	9	23
Night	0	19	10	3	4	5	6	7	8	9	19
Action	0	20	2	3	4	5	6	7	8	9	20
Beach	0	21	2	3	4	5	6	7	8	9	21
...
ISO800	0	15	2	3	4	5	6	7	8	9	15
ISO1600	0	16	2	3	4	5	6	7	8	9	16

AE P-Line table mapping

Each AE P-Line table includes : (for customized)

- AE table ID (Enum *eAETableID* defined in *AEPlinetable.h*)
- 50Hz AE P-line (Shutter speed should be multiples of 1/100s (10.0 ms))
- 60Hz AE P-line (Shutter speed should be multiples of 1/120s (8.33 ms))
- Total index, MaxBV, MinBV,

ex.

```
static strAETable g_AE_PreviewAutoTable =
{
    AETABLE_RPEVIEW_AUTO, //eAETableID
    157, //u4TotalIndex
    20, //u4StrobeTrigerBV
    113, //i4MaxBV
    -43, //i4MinBV
    90, //i4EffectiveMaxBV
    -50, //i4EffectiveMinBV
    LIB3A_AE_ISO_SPEED_AUTO, //ISO SPEED
    sPreviewPLineTable_60Hz,
    sPreviewPLineTable_50Hz,
    NULL,
};
```


Code & Log Analysis

Code list:

1/vendor/mediatek/proprietary/custom/mt6771/hal/imgsensor/ver1/xxx_mipi_raw/camera_AE_PLInetable_xxxmipiraw.h
2 /vendor/mediatek/proprietary/custom/common/hal/inc/custom/aaa/AEPlinetable.h

```
typedef struct
{
    LIB3A_AE_SCENE_T eAEScene;
    eAETableID ePLineID[11];
} strAEPLineMapping;
```

11 sensor modes

```
static strAESceneMapping g AEScenePLineMapping =
```

ePLineID

LIB3A AE SCENE AUTO, {AETABLE RPREVIEW AUTO, AETABLE CAPTURE AUTO, AETABLE_VIDEO AUTO, AETABLE_VIDEO1 AUTO, AET
LIB3A AE SCENE NIGHT, {AETABLE RPREVIEW AUTO, AETABLE_SCENE_INDEX1, AETABLE_VIDEO NIGHT, AETABLE_VIDEO1 AUTO, AE
LIB3A AE SCENE ACTION, {AETABLE RPREVIEW AUTO, AETABLE_SCENE_INDEX2, AETABLE_VIDEO AUTO, AETABLE_VIDEO1 AUTO, AE
LIB3A AE SCENE BEACH, {AETABLE RPREVIEW AUTO, AETABLE_SCENE_INDEX3, AETABLE_VIDEO AUTO, AETABLE_VIDEO1 AUTO, AET
LIB3A AE SCENE CANDLELIGHT, {AETABLE RPREVIEW AUTO, AETABLE_SCENE_INDEX1, AETABLE_VIDEO AUTO, AETABLE_VIDEO1 AUT
LIB3A AE SCENE FIREWORKS, {AETABLE RPREVIEW AUTO, AETABLE_SCENE_INDEX4, AETABLE_VIDEO AUTO, AETABLE_VIDEO1 AUTO,
LIB3A AE SCENE LANDSCAPE, {AETABLE RPREVIEW AUTO, AETABLE_SCENE_INDEX3, AETABLE_VIDEO AUTO, AETABLE_VIDEO1 AUTO,
LIB3A AE SCENE PORTRAIT, {AETABLE RPREVIEW AUTO, AETABLE_SCENE_INDEX2, AETABLE_VIDEO AUTO, AETABLE_VIDEO1 AUTO,
LIB3A AE SCENE NIGHT PORTRAIT, {AETABLE RPREVIEW AUTO, AETABLE_SCENE_INDEX1, AETABLE_VIDEO NIGHT, AETABLE_VIDEO1
LIB3A AE SCENE PARTY, {AETABLE RPREVIEW AUTO, AETABLE_SCENE_INDEX1, AETABLE_VIDEO AUTO, AETABLE_VIDEO1 AUTO, AET
LIB3A AE SCENE SNOW, {AETABLE RPREVIEW AUTO, AETABLE_SCENE_INDEX3, AETABLE_VIDEO AUTO, AETABLE_VIDEO1 AUTO, AETA
LIB3A AE SCENE SPORTS, {AETABLE RPREVIEW AUTO, AETABLE_SCENE_INDEX2, AETABLE_VIDEO AUTO, AETABLE_VIDEO1 AUTO, AE
LIB3A AE SCENE STEADYPHOTO, {AETABLE RPREVIEW AUTO, AETABLE_SCENE_INDEX2, AETABLE_VIDEO AUTO, AETABLE_VIDEO1 AUT
LIB3A AE SCENE SUNSET, {AETABLE RPREVIEW AUTO, AETABLE_SCENE_INDEX3, AETABLE_VIDEO AUTO, AETABLE_VIDEO1 AUTO, AE
LIB3A AE SCENE THEATRE, {AETABLE RPREVIEW AUTO, AETABLE_SCENE_INDEX1, AETABLE_VIDEO AUTO, AETABLE_VIDEO1 AUTO, A
LIB3A AE SCENE ISO ANTI SHAKE, {AETABLE RPREVIEW AUTO, AETABLE_SCENE_INDEX2, AETABLE_VIDEO AUTO, AETABLE_VIDEO1

eAEScene

Code & Log Analysis

3/vendor/mediatek/proprietary/hardware/mtkcam/aaa/source/isp_50/ae_mgr/**ae_mgr_pline.cpp**

```
MRESULT AeMgr::setAEScene(LIB3A_AE_SCENE_T a_eAEScene)
{
    MRESULT mr;
    eAETableID ePreviewPLineTableID, eCapturePLineTableID;
    AE_LOG_IF(m_3ALogEnable, "[setAEScene]setAEScene:%d \n", a_eAEScene);

    if(m_pAEPLineTable != NULL) { // protect the AE Pline table don't ready
        mr = getAEPLineMappingID(m_eAEScene, m_eSensorMode, &ePreviewPLineTableID, &eCapturePLineTableID);
        if(FAILED(mr)) {
            CAM_LOGE("[setAEScene]Get capture table ERROR :%d PLineID:%d %d\n", m_eAEScene, ePreviewPLineTableID, eCapturePLineTableID);
        }

        mr = setAETable(ePreviewPLineTableID, eCapturePLineTableID);
        if(FAILED(mr)) {
            CAM_LOGE("[setAEScene]Capture table ERROR :%d PLineID:%d %d\n", m_eAEScene, ePreviewPLineTableID, eCapturePLineTableID);
        }

        if ((m_eAEScene == LIB3A_AE_SCENE_AUTO) && (m_u4AEISOSpeed != (MUINT32) LIB3A_AE_ISO_SPEED_AUTO))
            setIsoSpeed(m_u4AEISOSpeed);
    }
} else {
    AE_LOG("[setAEScene]setAEScene:%d, AE Pline table is NULL \n", a_eAEScene);
}
```

Code & Log Analysis

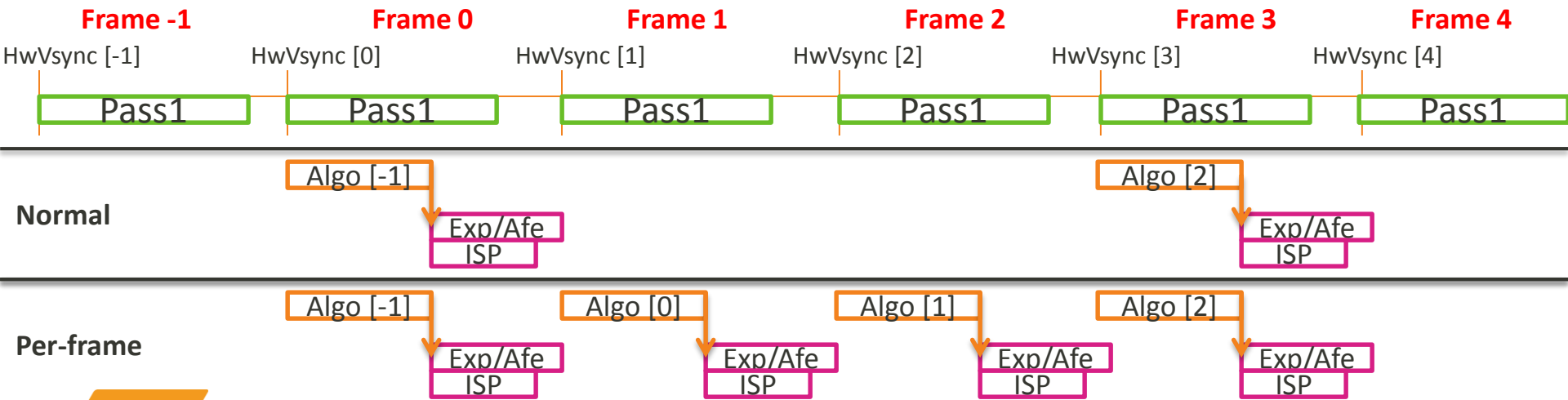
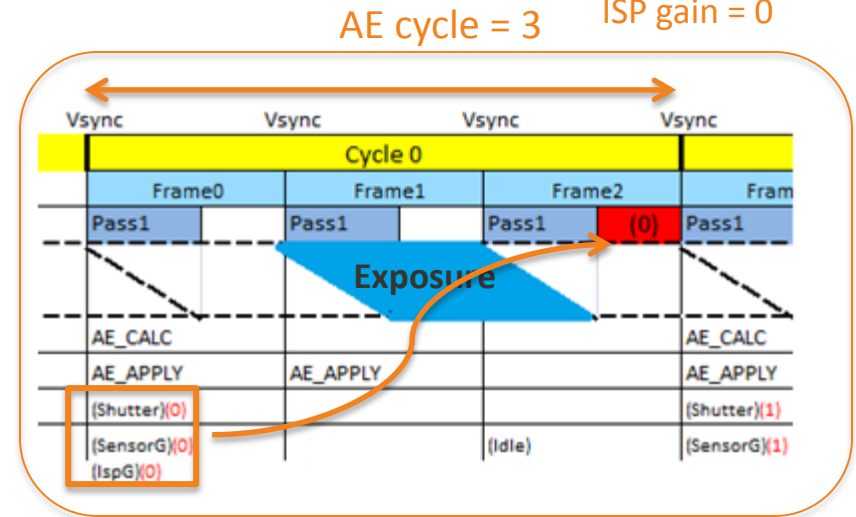
```
576 3269 D ae_mgr : [setSensorMode()] m_eSensorDev: 1 i4NewSensorMode: 0
576 3269 D ae_mgr : [setAEScene]setAEScene:1
576 3269 D ae_mgr : [getAEPLineMappingID()] m_eSensorDev: 1 SceneId:1 ISO:0 CamMode:5
    SensorIdx:0
576 3269 D ae_mgr : [getAEPLineMappingID] SceneID:1 Pre:0 CapID:1
576 3269 D ae_mgr : [setAETable] TableID:0 1 Flicker:2 Flicker Auto:0 i4SensorMode:0
mbIsPlineChange = MTRUE
576 3269 D ae_mgr : [setAETable] i/TotalIdx: 0/147
576 3269 D ae_mgr : [setAETable] i/ePreviewPLineTableID/TotalIdx: 0/0/147
576 3269 D ae_mgr : [setAETable] i/TotalIdx: 1/147
576 3269 D ae_mgr : [setAETable] i/eCapturePLineTableID/TotalIdx: 1/1/147
```

AE Updated Cycle

Delay frames :
Shutter = 2
Sensor gain = 2
ISP gain = 0

CPU Automatic Exposure flow

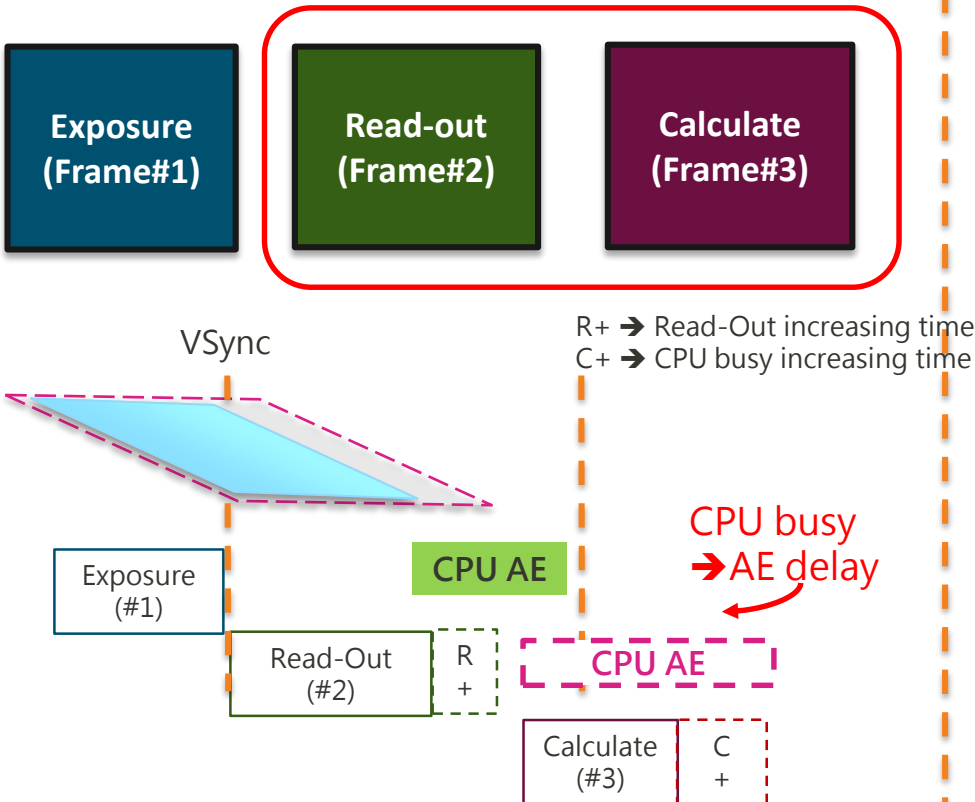
- (0) 3A framework wait for V-sync signal
- (1) De-queue AAO after P1 done
- (2) AE algorithm Calculation (Frame#0)
- (3) Send Sensor command (shutter and gain) (Frame#0)
- (4) Send ISP command (Frame#0) (by Tuning Pipe)
- (5) Return AE result to 3A framework and ISP manager
Sensor starts to expose (Frame#1)
- (6) Idle in Frame #1 and #2



CPU AE VS CCU AE

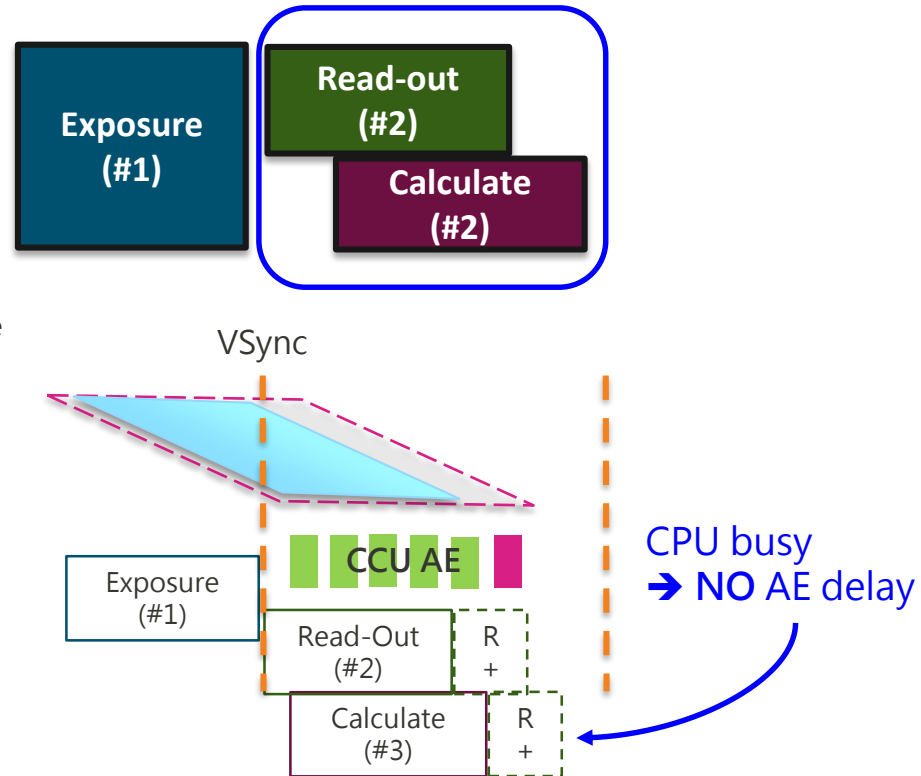
- Goal: CCU reduces AE cycle from 3 to 2, speeding up AE convergence.

CPU



Issue : CPU resource is **SHARED**. long sensor read-out time & CPU busy →
Calculate done next frame, AE cycle = 3

CCU



Solution : CCU resource is **DEDICATED**, even long sensor read-out & CPU busy →
Calculate done the same frame, AE cycle = 2

CCU ON

- CCU AE work flow:



Log Analysis

01:31:09.934985 576 3239 D **HwIRQ3A : [wait] VSIrq**
01:31:09.936247 576 3239 D AeFlowCCU: [controlCCU()]magic_num:0x4
01:31:09.937211 576 3239 D **AeFlowCCU: [getCCUResult()] ExpSetStat: 1 Index/: 387**
01:31:09.937248 576 3239 D **ae_mgr : [copyCCUAEInfo2mgr() CCU Nextidx 129->387]**
01:31:09.937481 576 3239 D AeFlowDefault: [monitorAndReschedule:Perframe AE] Calc:1 Apply:1 Magic:4 AEMonitorStable:0 VdCnt:0 **u4CwvYcur:4**
u4CwvYpre:0
01:31:09.937757 576 3239 D ae_mgr : [updateAEInfo2ISP] State:0 VNum:0 **Shutter:40004 Gain:8192 2814** 2199 Flare
FrameDuration:40020000 CCU ON:1 ExpRatio:100 eAEState:1 CurrentidxF:387 m_blsMaxIndexStable:0,FDT:0, FDY:0
01:31:09.975384 576 3239 D **HwIRQ3A : [wait] VSIrq**
01:31:09.976528 576 3239 D AeFlowCCU: [controlCCU()]magic_num:0x5
01:31:09.977503 576 3239 D **AeFlowCCU: [getCCUResult()] ExpSetStat: 1 Index/: 401**
01:31:09.977552 576 3239 D **ae_mgr : [copyCCUAEInfo2mgr() CCU Nextidx 129->401]**
01:31:09.977800 576 3239 D AeFlowDefault: [monitorAndReschedule:Perframe AE] Calc:1 Apply:1 Magic:5 AEMonitorStable:0 VdCnt:0 **u4CwvYcur:4**
u4CwvYpre:0
01:31:09.978048 576 3239 D ae_mgr : [updateAEInfo2ISP] State:0 VNum:0 **Shutter:40004 Gain:8192 3886** 3036 Flare offset:82 522
FrameDuration:40020000 CCU ON:1 ExpRatio:100 eAEState:1 CurrentidxF:401 m_blsMaxIndexStable:0,FDT:0, FDY:0
01:31:10.015474 576 3239 D **HwIRQ3A : [wait] VSIrq**
01:31:10.016572 576 3239 D AeFlowCCU: [controlCCU()]magic_num:0x6
01:31:10.017566 576 3239 D **AeFlowCCU: [getCCUResult()] ExpSetStat: 1 Index/: 415**
01:31:10.017616 576 3239 D **ae_mgr : [copyCCUAEInfo2mgr() CCU Nextidx 133->415]**
01:31:10.017840 576 3239 D AeFlowDefault: [monitorAndReschedule:Perframe AE] Calc:1 Apply:1 Magic:6 AEMonitorStable:0 VdCnt:0 **u4CwvYcur:22**
u4CwvYpre:0
01:31:10.018085 576 3239 D ae_mgr : [updateAEInfo2ISP] State:0 VNum:0 **Shutter:40004 Gain:8192 5328** 4163 Flare offset:74 521
FrameDuration:40020000 CCU ON:1 ExpRatio:100 eAEState:1 CurrentidxF:415 m_blsMaxIndexStable:0,FDT:0, FDY:0
01:31:10.055328 576 3239 D **HwIRQ3A : [wait] VSIrq**
01:31:10.057011 576 3375 D AeFlowCCU: [controlCCU()]magic_num:0x7
01:31:10.057991 576 3239 D **AeFlowCCU: [getCCUResult()] ExpSetStat: 1 Index/: 423**
01:31:10.058035 576 3239 D **ae_mgr : [copyCCUAEInfo2mgr() CCU Nextidx 138->423]**
01:31:10.058250 576 3239 D AeFlowDefault: [monitorAndReschedule:Perframe AE] Calc:1 Apply:1 Magic:7 AEMonitorStable:0 VdCnt:0 **u4CwvYcur:28**
u4CwvYpre:0
01:31:10.058502 576 3239 D ae_mgr : [updateAEInfo2ISP] State:0 VNum:0 **Shutter:40004 Gain:8192 6424** 5019 Flare offset:66 520
FrameDuration:40020000 CCU ON:1 ExpRatio:100 eAEState:1 CurrentidxF:423 m_blsMaxIndexStable:0,FDT:0, FDY:0
01:31:10.095442 576 3239 D **HwIRQ3A : [wait] VSIrq**

**Magic4 set index387
Magic5 Exposure
Magic6 Readout & cal**

**Magic5 set index401
Magic6 Exposure
Magic7 Readout & cal**

Log Analysis

01:31:10.096474 576 3239 D AeFlowCCU: [controlCCU()]magic_num:0x8
01:31:10.097505 576 3239 D AeFlowCCU: [getCCUResult()] ExpSetStat: 1 Index/: 427
01:31:10.097547 576 3239 D ae_mgr : [copyCCUAEInfo2mgr() CCU Nextidx 141->427]
01:31:10.097776 576 3239 D AeFlowDefault: [monitorAndReschedule:Perframe AE] Calc:1 Apply:1 Magic:8 AEMonitorStable:0
VdCnt:0 **u4CwvYcur:37** u4CwvYpre:0
01:31:10.098019 576 3239 D ae_mgr : [updateAEInfo2ISP] State:0 VDDNum:0 Shutter:40004 Gain:8192 7040 5500 Flare
offset:58 519 FrameDuration:40020000 CCU ON:1 ExpRatio:100 eAEState:1 CurrentidxF:427 m_blsMaxIndexStable:0,FDT:0, FDY:0
01:31:10.135624 576 3239 D **HwIRQ3A : [wait] VSIrq**
01:31:10.137290 576 3375 D AeFlowCCU: [controlCCU()]magic_num:0x9
01:31:10.137714 576 3239 D AeFlowCCU: [getCCUResult()] ExpSetStat: 1 Index/: 429
01:31:10.137762 576 3239 D ae_mgr : [copyCCUAEInfo2mgr() CCU Nextidx 142->429]
01:31:10.137995 576 3239 D AeFlowDefault: [monitorAndReschedule:Perframe AE] Calc:1 Apply:1 Magic:9 AEMonitorStable:0
VdCnt:0 **u4CwvYcur:44** u4CwvYpre:0
01:31:10.138268 576 3239 D ae_mgr : [updateAEInfo2ISP] State:0 VDDNum:0 Shutter:49998 Gain:8192 5904 4613 Flare
offset:64 520 FrameDuration:50025000 CCU ON:1 ExpRatio:100 eAEState:1 CurrentidxF:429 m_blsMaxIndexStable:0,FDT:0, FDY:0
01:31:10.185700 576 3239 D **HwIRQ3A : [wait] VSIrq**
01:31:10.190345 576 3239 D AeFlowCCU: [getCCUResult()] ExpSetStat: 1 Index/: 429
01:31:10.190401 576 3239 D ae_mgr : [copyCCUAEInfo2mgr() CCU Nextidx 143->429]
01:31:10.190627 576 3239 D AeFlowDefault: [monitorAndReschedule:Perframe AE] Calc:1 Apply:1 Magic:10 AEMonitorStable:1
VdCnt:0 **u4CwvYcur:48** u4CwvYpre:50
20011 01-08 01:31:10.240398 576 3239 D AeFlowDefault: [monitorAndReschedule:Perframe AE] Calc:1 Apply:1 Magic:11
AEMonitorStable:1 VdCnt:0 **u4CwvYcur:50** u4CwvYpre:50
21441 01-08 01:31:10.293016 576 3239 D AeFlowDefault: [monitorAndReschedule:Perframe AE] Calc:1 Apply:1 Magic:12
AEMonitorStable:1 VdCnt:0 **u4CwvYcur:50** u4CwvYpre:50

CCU off

- CPU AE work flow:

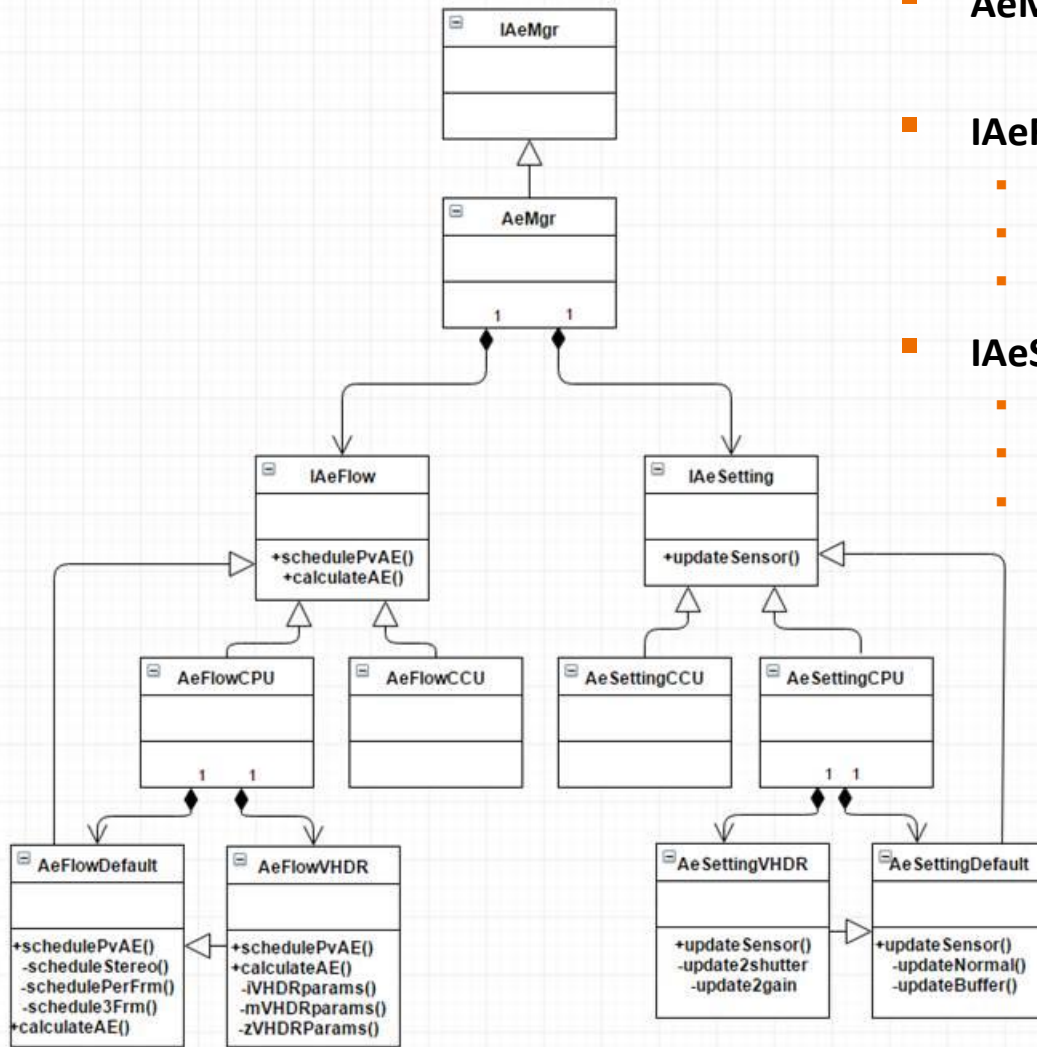


Log Analysis

- 9908 01-08 16:15:43.357995 579 2910 D **HwIRQ3A : [wait] VSirq**
- 9965 01-08 16:15:43.359955 579 2910 D AeFlowDefault: [monitorAndReschedule:Perframe AE] Calc:1 Apply:1 Magic:2
AEMonitorStable:0 VdCnt:0 u4CwvYcur:6 u4CwvYpre:0
- 10050 01-08 16:15:43.360916 579 2910 D ae_mgr : [copyAEInfo2mgr()] m_u4Index:90 **m_u4IndexF:272**
- 10059 01-08 16:15:43.361116 579 2910 D ae_mgr : [updateAEInfo2ISP] State:0 VdNum:0 **Shutter:29997 Gain:2000 1056** 202 Flare
offset:0 512 FrameDuration:33350000 CCU ON:0 ExpRatio:100 eAEState:1 CurrentidxF:272 m_blsMaxIndexStable:0,FDT:0, FDY:0
- 10310 01-08 16:15:43.390856 579 2910 D **HwIRQ3A : [wait] VSirq**
- 10371 01-08 16:15:43.392712 579 2910 D AeFlowDefault: [monitorAndReschedule:Perframe AE] Calc:1 Apply:1 Magic:3
AEMonitorStable:0 VdCnt:0 u4CwvYcur:6 u4CwvYpre:0
- 10437 01-08 16:15:43.393563 579 2910 D ae_mgr : [copyAEInfo2mgr()] m_u4Index:93 m_u4IndexF:279
- 10445 01-08 16:15:43.393742 579 2910 D ae_mgr : [updateAEInfo2ISP] State:0 VdNum:0 **Shutter:29997 Gain:2400 1040** 238 Flare
offset:0 512 FrameDuration:33350000 CCU ON:0 ExpRatio:100 eAEState:1 CurrentidxF:279 m_blsMaxIndexStable:0,FDT:0, FDY:0
- 10549 01-08 16:15:43.423706 579 2910 D **HwIRQ3A : [wait] VSirq**
- 10602 01-08 16:15:43.427009 579 2910 D AeFlowDefault: [monitorAndReschedule:Perframe AE] Calc:1 Apply:1 Magic:4
AEMonitorStable:0 VdCnt:0 u4CwvYcur:6 u4CwvYpre:0
- 10673 01-08 16:15:43.428950 579 2910 D ae_mgr : [copyAEInfo2mgr()] m_u4Index:94 m_u4IndexF:283
- 10681 01-08 16:15:43.429344 579 2910 D ae_mgr : [updateAEInfo2ISP] State:0 VdNum:0 **Shutter:29997 Gain:2608 1048** 261 Flare
offset:0 512 FrameDuration:33350000 CCU ON:0 ExpRatio:100 eAEState:1 CurrentidxF:283 m_blsMaxIndexStable:0,FDT:0, FDY:0
- 10764 01-08 16:15:43.457494 579 2910 D **HwIRQ3A : [wait] VSirq**
- 10821 01-08 16:15:43.459780 579 2910 D AeFlowDefault: [monitorAndReschedule:Perframe AE] Calc:1 Apply:1 Magic:5
AEMonitorStable:0 VdCnt:0 **u4CwvYcur:23** u4CwvYpre:0
- 10929 01-08 16:15:43.461066 579 2910 D ae_mgr : [updateAEInfo2ISP] State:0 VdNum:0 Shutter:29997 Gain:3424 1032 337 Flare
offset:15 513 FrameDuration:33350000 CCU ON:0 ExpRatio:100 eAEState:1 CurrentidxF:294 m_blsMaxIndexStable:0,FDT:0, FDY:0
- 11025 01-08 16:15:43.491258 579 2910 D **HwIRQ3A : [wait] VSirq**
- 11077 01-08 16:15:43.494302 579 2910 D AeFlowDefault: [monitorAndReschedule:Perframe AE] Calc:1 Apply:1 Magic:6
AEMonitorStable:0 VdCnt:0 **u4CwvYcur:27** u4CwvYpre:0
- 11154 01-08 16:15:43.496257 579 2910 D ae_mgr : [copyAEInfo2mgr()] m_u4Index:99 m_u4IndexF:298
- 11162 01-08 16:15:43.496592 579 2910 D ae_mgr : [updateAEInfo2ISP] State:0 VdNum:0 Shutter:29997 Gain:3696 1040 367 Flare
offset:35 516 FrameDuration:33350000 CCU ON:0 ExpRatio:100 eAEState:1 CurrentidxF:298 m_blsMaxIndexStable:0,FDT:0, FDY:0
- 11272 01-08 16:15:43.525059 579 2910 D **HwIRQ3A : [wait] VSirq**
- 11322 01-08 16:15:43.527300 579 2910 D AeFlowDefault: [monitorAndReschedule:Perframe AE] Calc:1 Apply:1 Magic:7
AEMonitorStable:0 VdCnt:0 **u4CwvYcur:29** u4CwvYpre:0

AE Class Diagram

- **IAeMgr** : Interface between AeMgr and 3A Hal
- **AeMgr** – Control AeFlowCPU/AeFlowCCU
AeSettingCPU/AeSettingCCU
- **IAeFlow** – Schedule and Calculate
 - AeFlowCCU – Control CCU interface (pass parameter to CCU)
 - AeFlowDefault – Control scheduling by stereo/per-frame/3-frames
 - AeFlowVHDR – Control i/m/z VHDR parameter transferring to AeMgr
- **IAeSetting** - setting to ISP/sensor driver
 - AeSettingCCU – Pass CPU setting to CCU
 - AeSettingDefault – Normal setting and Buffer mode setting (120/240fps)
 - AeSettingVHDR – Normal setting and 2shutter/2gain setting (zVHDR)

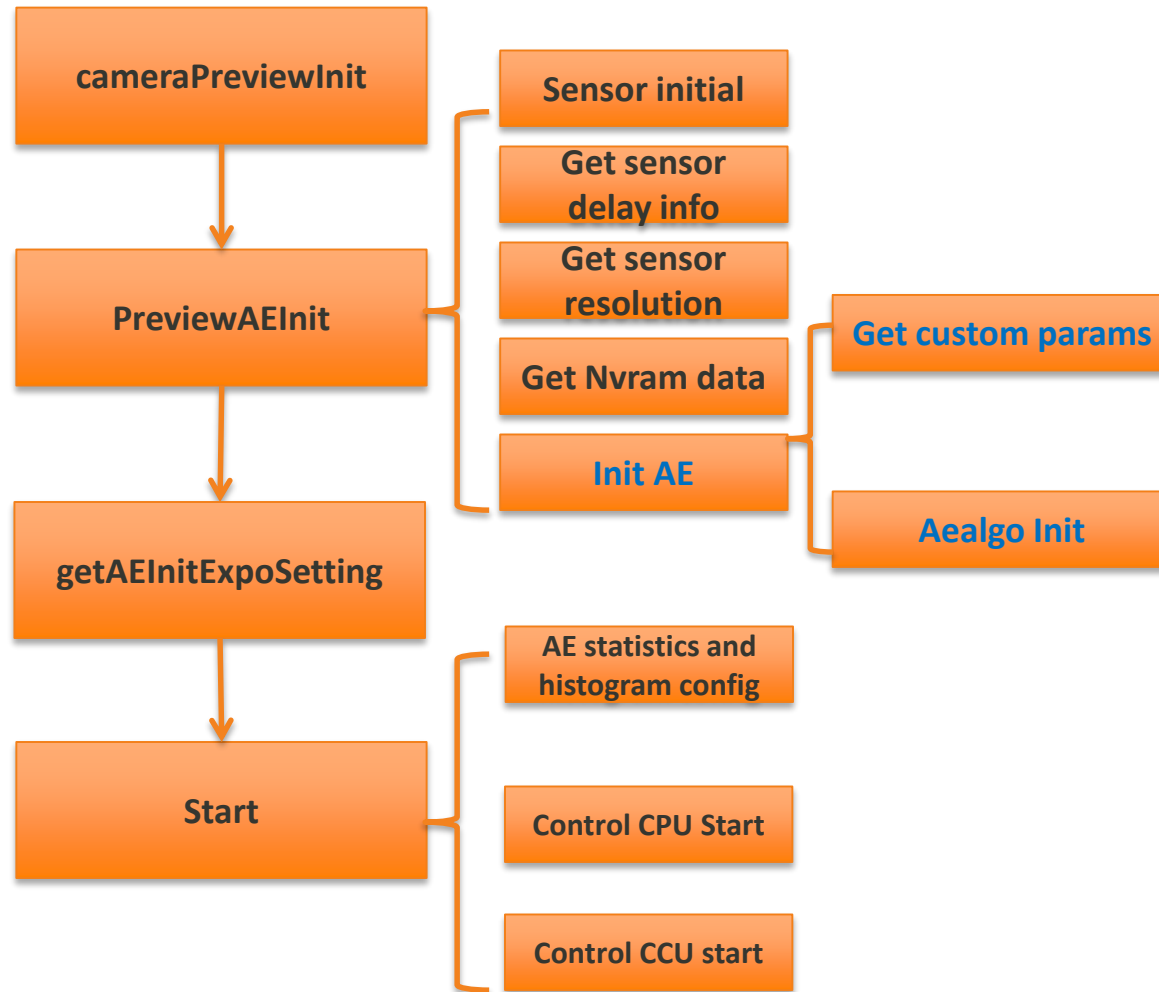


[AeFlow]
 AeSetting
 ae_cct_feature
 ae_mgr
 ae_mgr
 ae_mgr_ctrl
 ae_mgr_flow
 ae_mgr_if
 ae_mgr_if
 ae_mgr_pline
 ae_mgr_setting
 AeTestImp
 IAeTest

AeSettingCCU
 AeSettingCCU
 AeSettingCPU
 AeSettingCPU
 AeSettingDefault
 AeSettingDefault
 AeSettingVHDR
 AeSettingVHDR
 IAeSetting
 IAeSetting

AeFlowCCU
 AeFlowCCU
 AeFlowCPU
 AeFlowCPU
 AeFlowDefault
 AeFlowDefault
 AeFlowVHDR
 AeFlowVHDR
 IAeFlow
 IAeFlow

AE Init flow



AE init log

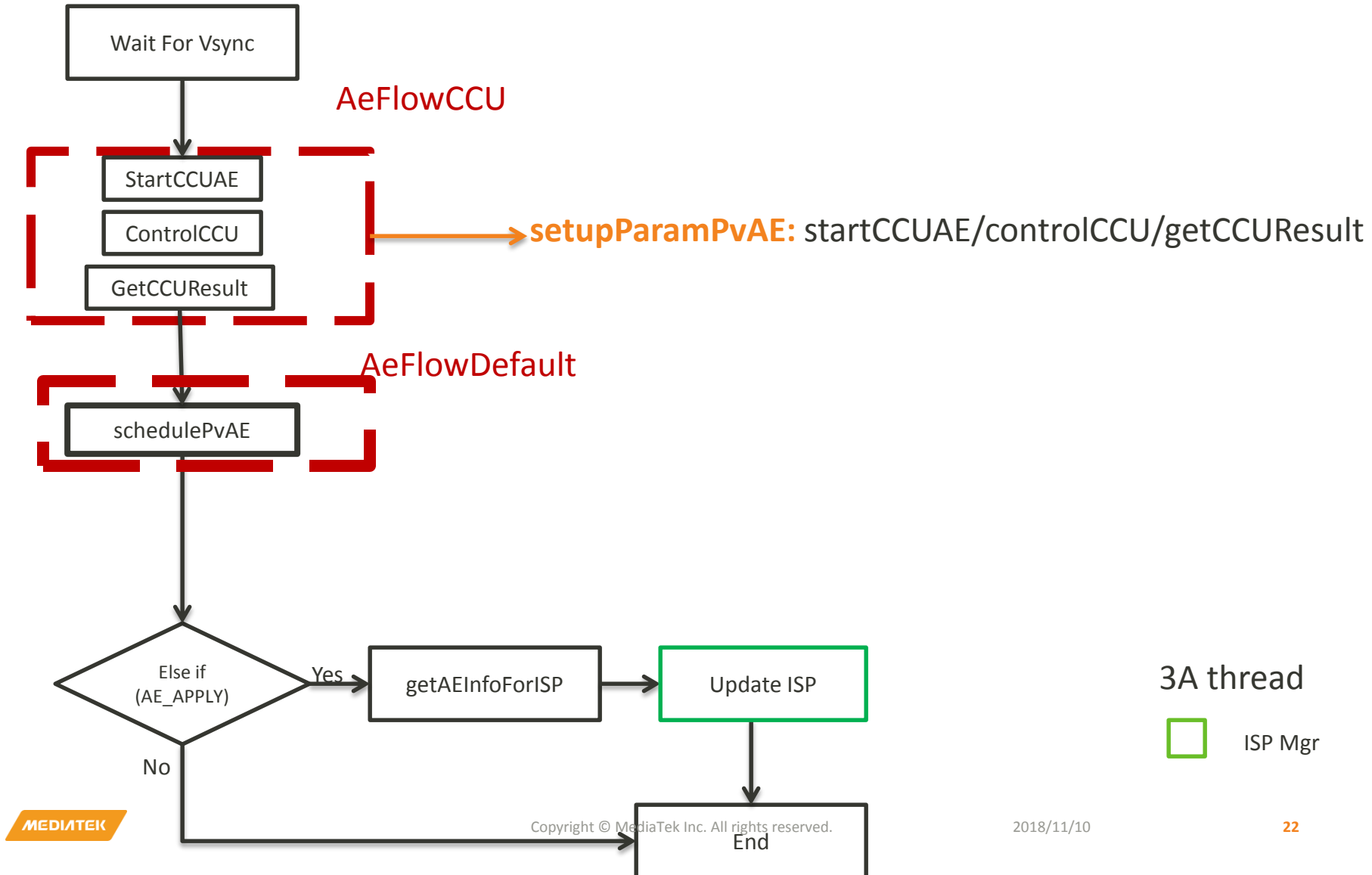
ae_mgr : [cameraPreviewInit()] m_eSensorDev: 1, i4SensorIdx = 0, m_eSensorMode = 0 CamMode:0
ae_mgr : [PreviewAEInit] SensorDelayInfo-> AeMgrDelayInfo (shutter/sensor gain/isp gain): 0/0/2 -> 0/0/0
ae_mgr : [getNvramData()] i4SensorDev:1
ae_mgr : [AEInit()] i4SensorDev:1 , AEtimer(uninit/init):53023403002/194076217610/141052814008 ,
bRealAEInit:1 , NumOfUsers=1
ae_mgr : [setCamScenarioMode()] m_eSensorDev: 1, m_eCamScenarioMode: 0 -> 0, blnit: 1
ae_mgr : [setNVRAMIndex()] m_eSensorDev: 1, m_u4AENVRAMIdx: 1 -> 1 blnit:1
ae_mgr : [AEInit()-getEVIdxInfo_v4p0] FinerEVIdxBase: 3 MaxIdx/MinIdx/Idx/MaxIdxF/MinIdxF/IdxF
:146/0/103/438/0/309
ae_mgr : [setAEScene]setAEScene:1
ae_mgr : [getAEPLineMappingID] SceneID:1 Pre:0 CapID:1
ae_mgr : [setAETable] TableID:0 1 Flicker:2 Flicker Auto:0 i4SensorMode:0 mblsPlineChange = MTRUE
ae_mgr : [setAETable] i/ePreviewPLineTableID/TotalIdx: 0/0/147
ae_mgr : [setAETable] i/eCapturePLineTableID/TotalIdx: 1/1/147
AeAlgoCtrl: [initAE] 0225 7513003 7482001 7471001 7525003 7471001
ae_mgr : [getAEInitExpoSetting()-setEVIdxInfo_v4p0] FinerEVIdxBase: 3 MaxIdx/MinIdx/Idx/MaxIdxF/MinIdxF/IdxF
:146/0/103/438/0/309
ae_mgr : [updateAEidxtoExpsetting:e] m_u4Index/m_u4IndexF/Exp/Afe/Isp/ISO : 103/309/29997/4896/1024/478
ae_mgr : [getAEInitExpoSetting()] u4Eposuretime(29997) u4AfeGain(4896) u4Eposuretime_se(0) u4AfeGain_se(0)
u4Eposuretime_me(0) u4AfeGain_me(0) u4Eposuretime_vse(0) u4AfeGain_vse(0)
ae_mgr : [Start] m_eSensorDev:1 m_eSensorTG:2 m_i4SensorIdx:0 m_eISPPProfile:0
AeAlgoCtrl: [modifyHistogramWinConfig] Use default height 89
AeFlowDefault: [start():1] LongCaptureThres:200000 MiniISOGain:100
ae_mgr : aeccu_AemgrStart
AeFlowCCU: [start():1]0/0
AeFlowCCU: CCU initial start, sensor id: 338
AeFlowCCU: ccu_ae_initialize success

CAMERA_NVRAM_DATA_3A
CAMERA_DATA_AE_PLINETABLE
CAMERA_NVRAM_DATA_ISP

setAETable

getAEInitExpo

doPvAE CCU on



doPvAE log

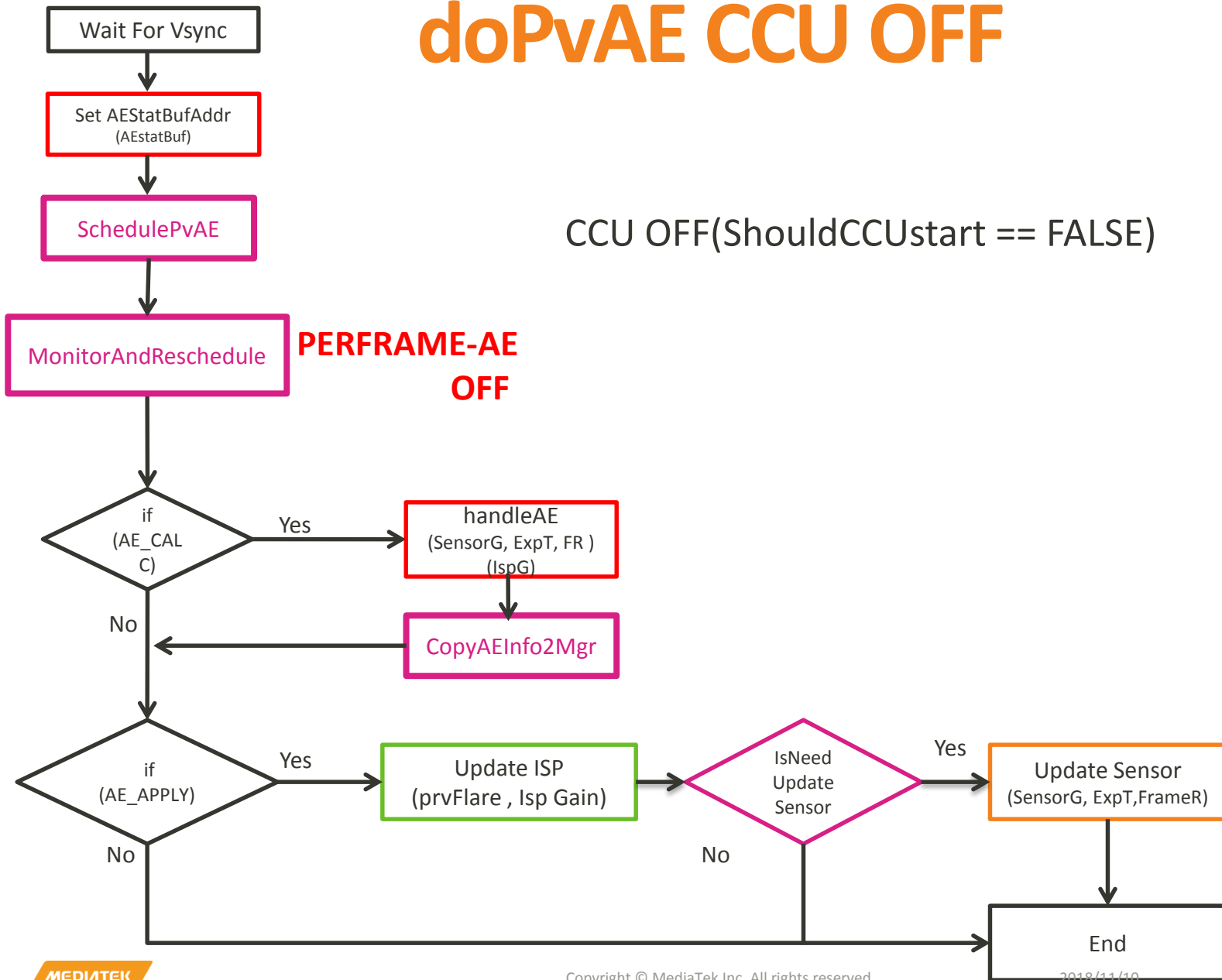
ae_mgr : [updateAEInfo2ISP] State:0 VNum:0 **Shutter:29997 Gain:4896 1024** 479 Flare offset:98 524
FrameDuration:33350000 CCU ON:1 ExpRatio:100 eAEState:1 CurrentidxF:309 m_blsMaxIndexStable:0,FDT:0, FDY:0
ae_mgr : [doPvAE()] AE config change (Skip AeAlgo once)
AeFlowCCU: [**startCCUAE()**]
AeFlowCCU: [**controlCCU()**]magic_num:0x1
AeFlowCCU: [**getCCUResult()**] **ExpSetStat: 0** Index/: 309
AeFlowDefault: [monitorAndReschedule:Perframe AE] Calc:1 Apply:1 Magic:1 AEMonitorStable:0 VdCnt:0 **u4CwvYcur:92**
u4CwvYpre:92
AeFlowCCU: [getCCUResult()] ExpSetStat: 0 Index/: 309
AeFlowDefault: [monitorAndReschedule:Perframe AE] Calc:1 Apply:1 Magic:2 AEMonitorStable:0 VdCnt:0 u4CwvYcur:0
u4CwvYpre:0
AeFlowCCU: [getCCUResult()] **ExpSetStat: 1** Index/: 387
ae_mgr : [**copyCCUAEInfo2mgr()** CCU Nextidx 129->387]
AeFlowDefault: [monitorAndReschedule:Perframe AE] Calc:1 Apply:1 Magic:4 AEMonitorStable:0 VdCnt:0 **u4CwvYcur:4**
u4CwvYpre:0
ae_mgr : [UpdateSensorISPParams:s] i4SensorDev:1 VNum 0, **Prev 29997/4896/1024, Output 40004/8192/2814**
Smooth:1 m_eAEState:1
ae_mgr : [updateAEInfo2ISP] State:0 VNum:0 Shutter:40004 Gain:8192 2814 2199 Flare offset:90 523
FrameDuration:40020000 CCU ON:1 ExpRatio:100 eAEState:1 CurrentidxF:387 m_blsMaxIndexStable:0,FDT:0, FDY:0
ae_mgr : [**updateSensorbyI2C()**] Pass CPU I2C setting

CCU calculate result flag
1 means CCU result is ready

AE thread: update sensor shutter & gain

doPvAE CCU OFF

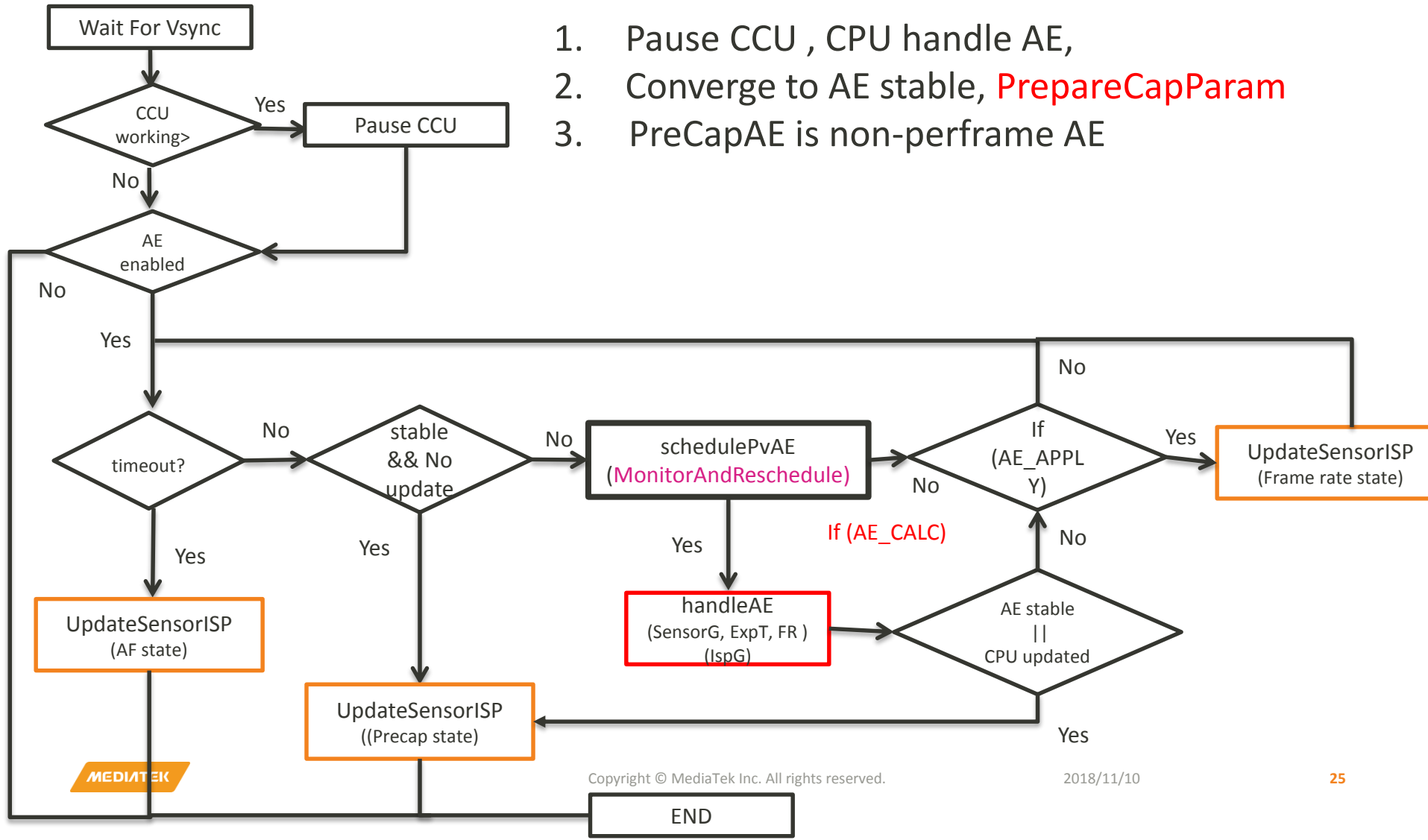
CCU OFF(ShouldCCUstart == FALSE)



DoPreCapAE

- AE Mgr pause CCU in Precapture Start → CPU AE flow

1. Pause CCU , CPU handle AE,
2. Converge to AE stable, **PrepareCapParam**
3. PreCapAE is non-perframe AE



DoPreCapAE log

874327 01-01 00:14:23.163488 756 11259 D ae_mgr : [doPreCapAE()] CPUNeedDebugInfo: 1 (1 Means AE is stable, force CPU algo handleAE, to avoid exif info cannot be written correctly)

874328 01-01 00:14:23.163506 756 11259 D AeFlowCCU: [pause()]

874329 01-01 00:14:23.163535 756 11259 D AeFlowCCU: [stop()]

874446 01-01 00:14:23.164435 756 11259 D ae_mgr : [doPreCapAE()] i4SensorDev:1 Ready:0 isStrobe:0 TimeOut:0 Add FD

874534 01-01 00:14:23.165497 756 11259 D AeFlowDefault: [monitorAndReschedule()] Calc:1 Apply:1 Cnt:0 Frame:0 Magic:56 ReSchedule:0 Exit:0 Skip:0 bStatChange:0 AEMonitorStable:0 VdCnt:0 FaceArea:1 FaceWOCnt:3 TouchArea:0 u4CwvYcur:67 u4CwvYpre:68

874535 01-01 00:14:23.165537 756 11259 D ae_mgr : [doPreCapAE()] CPU AE needs calculation for debug info, bCalculateAE = 1, bApplyAE = 1 (force change Calc =1, Apply =1)

875789 01-01 00:14:23.193714 756 11259 D AeFlowDefault: [calculateAE():PassToAlgo] EvSetting/AEidx/Tgid [N-1]:29996/7168/1030/111/111 [N-2]:29996/6400/1043/109/109 [N-3]:29996/6400/1043/109/109 FrameCnt/Tgcnt/Magic(1/1/56) (CPU Algo handleAE)

875792 01-01 00:14:23.193888 756 11259 D AeFlowDefault: [updatePreEvSettingQueue()] m_PreEvSettingQueue[N-1]:29996/7680/1034 m_PreEvSettingQueue[N-2]:29996/7168/1030 m_PreEvSettingQueue[N-3]:29996/6400/1043 FrameCnt(1) FrameTgCnt(1) HwMagicNum(56)

912756 01-01 00:14:24.828197 756 11259 D ae_mgr : [prepareCapParams()] i4SensorDev:1 m_eShotMode:0 (if AE stable,prepareCapParams)

912762 01-01 00:14:24.828252 756 11259 D ae_mgr : [doPreCapAE] State:5 SensorDev:1 Exp mode:0 Shutter:29996 Sensor gain:6656 lsp gain:1071 flare:516 32 ISO:679

912764 01-01 00:14:24.828268 756 11259 D ae_mgr : [doPreCapAE] AF Exp mode:0 Shutter:0 Sensor gain:0 lsp gain:0 flare:0 0 ISO:0

912766 01-01 00:14:24.828294 756 11259 D ae_mgr : [doPreCapAE] Capture Exp mode: 0 Shutter:29996 Sensor gain:6656 lsp gain:1071 flare:516 32 ISO:679 (Usually Capture will use this exposure setting)

Trouble shooting

Case 1 : AE frame rate fixed

- **Description:** preview/video is dark
- **Analysis:** The frame rate is fixed by 30fps, so the shutter cannot increase

ae_mgr : m_i4AEMinFps: 300 m_i4AEMaxFps:300

MtkCam/HalSensor: [sendCommand] Exposure Time: 30005

MtkCam/HalSensor: [sendCommand] Exposure Time: 30005

- **Solution:** Modify fps, Please refer to FAQ18200.

Case 2 AE peak caused by sensor driver

- **Description:** preview Ae peak
- **Analysis:** find the peak position, check the exposure setting from AE& driver before peak & peak are equal or not.
- **Solution:** Modify sensor driver

```
ae_mgr : [updateAEInfo2ISP] State:0 VNum:2 Shutter:10002 Gain:1856 1048 186 Flare offset:96 524
HwIRQ3A : [wait] VSirq
AeAlgo : [setAESatisticBufferAddrIp_v4p0] AvgY:76 CWV:67 m_u4LinearCWValue:107 CWValue:67
AeFlowDefault: [monitorAndReschedule()] Calc:1 Apply:1 Cnt:3 Frame:0 Magic:23 ReSchedule:0 Exit:0
ae_mgr : [updateAEInfo2ISP] State:0 VNum:0 Shutter:20003 Gain:1024 1024 100 Flare offset:96 524
HwIRQ3A : [wait] VSirq
AeAlgo : [setAESatisticBufferAddrIp_v4p0] AvgY:76 CWV:66 m_u4LinearCWValue:106 CWValue:66
AeFlowDefault: [monitorAndReschedule()] Calc:0 Apply:1 Cnt:4 Frame:1 Magic:24 ReSchedule:0 Exit:0
ae_mgr : [updateAEInfo2ISP] State:0 VNum:1 Shutter:20003 Gain:1024 1024 100 Flare offset:96 524
HwIRQ3A : [wait] VSirq
AeAlgo : [setAESatisticBufferAddrIp_v4p0] AvgY:76 CWV:66 m_u4LinearCWValue:105 CWValue:66
AeFlowDefault: [monitorAndReschedule()] Calc:0 Apply:1 Cnt:5 Frame:2 Magic:25 ReSchedule:0 Exit:0
ae_mgr : [updateAEInfo2ISP] State:0 VNum:2 Shutter:20003 Gain:1024 1024 100 Flare offset:96 524
HwIRQ3A : [wait] VSirq
AeAlgo : [setAESatisticBufferAddrIp_v4p0] AvgY:102 CWV:94 m_u4LinearCWValue:145 CWValue:94
AeFlowDefault: [monitorAndReschedule()] Calc:1 Apply:1 Cnt:6 Frame:0 Magic:26 ReSchedule:0 Exit:0
ae_mgr : [updateAEInfo2ISP] State:0 VNum:0 Shutter:10002 Gain:1536 1060 156 Flare offset:98 524
HwIRQ3A : [wait] VSirq
AeAlgo : [setAESatisticBufferAddrIp_v4p0] AvgY:101 CWV:93 m_u4LinearCWValue:143 CWValue:93
AeFlowDefault: [monitorAndReschedule()] Calc:0 Apply:1 Cnt:7 Frame:1 Magic:27 ReSchedule:0 Exit:0
ae_mgr : [updateAEInfo2ISP] State:0 VNum:1 Shutter:10002 Gain:1536 1060 156 Flare offset:98 524
HwIRQ3A : [wait] VSirq
AeAlgo : [setAESatisticBufferAddrIp_v4p0] AvgY:102 CWV:93 m_u4LinearCWValue:144 CWValue:93
AeFlowDefault: [monitorAndReschedule()] Calc:0 Apply:1 Cnt:8 Frame:2 Magic:28 ReSchedule:0 Exit:0
ae_mgr : [updateAEInfo2ISP] State:0 VNum:2 Shutter:10002 Gain:1536 1060 156 Flare offset:98 524
HwIRQ3A : [wait] VSirq
AeAlgo : [setAESatisticBufferAddrIp_v4p0] AvgY:77 CWV:67 m_u4LinearCWValue:108 CWValue:67
```

Frame0 : exposure setting change
10ms/ISO186 \approx 20ms/ISO100
Cwv67 != cwv94

```
[6250:AESENTHD] _4C_camera_sensor[write_shutter] shutter = 1142, framelength = 3861, realtime_fps = 296
[6250:AESENTHD] _4C_camera_sensor[set_gain] gain = 116, reg_gain = 0xe8
[6250:AESENTHD] _4C_camera_sensor[write_shutter] shutter = 2286, framelength = 3861, realtime_fps = 296
[6250:AESENTHD] _4C_camera_sensor[set_gain] gain = 64, reg_gain = 0x80
```

Case 3: Touch AE peak

- **Description:** Touch Ae peak
- **Analysis:** the metering area set by AP is abnormal, before sending correct area, it will send a zero area which will make AE calculate as normal AE, once AP send correct area, AE will do Touch AE.,then AE peak happens.

```
AeAlgo : [getRecommendCWTarget_v2p0] u4FinalCW:50, m_u4AvgWValue/m_u4CWValue:23/23, weight(aoe/abl/hs/ns): 1024,0,1024,180, target:
AeAlgo : [getRecommendCWTarget_v2p0] Final AE Target 22, AvgY/CWY: 23/23, AOE/BL/HS/NS 35/64/64/48 //touch后的target
AeAlgo : [getDeltaIndex_v2p0] CWvalue:23 CWR:22 Delta:0 Con:0x00000016 Y:23 Index:89 m_bAEOneShot:0 Stable:1 LinearResp(i4PredDelt:
MtkCam/CamAdapter: (337)(MtkZsd)[setParameters] Metering Areas:(0,0,0,0) //送0框下来
AeAlgo : [setAEMeteringArea] 0 XLow:0 XHi:0 YLow:0 YHi:0 Weight:0
AeAlgo : [getRecommendCWTarget_v2p0] u4FinalCW:49, m_u4AvgWValue/m_u4CWValue:23/23, weight(aoe/abl/hs/ns): 1024,0,1024,180, target:
AeAlgo : [checkMeterFaceAE] m_u4CWValue/a_u4CWTarget/m_u4MeterY/m_MeterFDSts.m_u4FDY/u4PrevFD/u4FaceFailCnt: 23/49/0/0/0/4
AeAlgo : [getRecommendCWTarget_v2p0] Final AE Target 49, AvgY/CWY: 23/23, AOE/BL/HS/NS 34/64/64/48 //最终的目标
AeAlgo : [getDeltaIndex_v2p0] CWvalue:23 CWR:49 Delta:11 Con:0x00000006 Y:23 Index:89 m_bAEOneShot:1 Stable:1 LinearResp(i4PredDelt:
MtkCam/CamAdapter: (337)(MtkZsd)[setParameters] Metering Areas:(270,-607,520,-273,1) //送正常框下来
AeAlgo : [setAEMeteringArea] 0 XLow:76 XHi:90 YLow:17 YHi:31 Weight:1
AeAlgo : [getRecommendCWTarget_v2p0] u4FinalCW:52, m_u4AvgWValue/m_u4CWValue:51/52, weight(aoe/abl/hs/ns): 1024,0,1024,157, target:
AeAlgo : [getRecommendCWTarget_v2p0] Final AE Target 34, AvgY/CWY: 51/52, AOE/BL/HS/NS 46/64/64/51
```

Normal AE

Touch AE

Case 4: MT6762 dual cam AE pline mapping error

- **Description:** dual camera AE pline is not correct
- **Analysis:** check the mapping rule & make sure the AE pline is really exist
 - Check the Mapping table
 - **Single cam** check `camera_ae_plinetable_xxx.h` `g_AEScenePLineMapping`
 - **Dual cam** check `ae_tuning_custom_xxx.cpp` `g_strStereoPLineMapping`
 - **HDR** check `ae_tuning_custom_xxx.cpp` `g_strHDRPLineMapping`
 - Find the tableID in the mapping table by sensor **mode+scene mode**
- **Solution:** Modify AE pline mapping & Gen Ae pline according to the mapping rule

Case 5: sub camera panel flash capture overexposure

- **Description:** Sub cam flash capture overexposure
- **Analysis:** Check the log find the pline index is very large when capture, because between backup & restore AE, the customer change to another group of tuning params which will make finerEVIndexBase change from 2 to 1.
- **Solution:** Each sensor's **u4FinerEvIndexBase** should be same

```
110212 01-05 03:16:51.698298 535 7122 D AeAlgoCtrl: [handleAE] eAeState:9 0
110213 01-05 03:16:51.698340 535 7122 D AeAlgoCtrl: Backup AE Index:116 232 BV:7 Exp:5269 Sensor
Gain:1024 ISP:1024
Before Backup: finerevindex Base is 2
Change to 1 & takepicture
115993 01-05 03:16:52.254790 535 7122 D AeAlgoCtrl: [setEVIDxInfo_v4p0] Max/Min/Current = 151/0/116
FMax/FMin/FCurrent = 151/0/116 IdxBASE:1
Restore is after changing to 1
116321 01-05 03:16:52.313651 535 7122 D AeAlgoCtrl: [handleAE] eAeState:10 0
116322 01-05 03:16:52.313669 535 7122 D AeAlgoCtrl: Restore AE:Index:116 232 Exp:39996 Sensor Gain:7
ISP:1024
```


API introduction

a. Flow Control

- **doPvAE**
 - Called after 3A hal receive Vsirq , control preview CCU / CPU algo
- **doAFAE**
 - Touch AE or Auto-focus, Converge AE fastly
- **doPreCapAE**
 - Called after 3A hal receive high-quality capture, coverge to AE stable
- **doCapAE**
 - high-quality capture switch to capture sensor mode, send AEMgr's restore exposure setting to sensor . **doCapFlare log print avgY** 看是否正常生效
- **doBackAEInfo**
 - Called by 3A HAL before flash open, CPU algo backup preview exposure setting
- **doRestoreAEInfo**
 - Called by 3A hal when close flash, CPU algo send the backAEInfo to Mgr for sensor driver, to avoid AE reconverge (Come in pairs with doBackAEInfo)
- **updateCaptureParams / updatePreviewParams**

For Flash updateAeParams

API introduction

b. 3A hal

- **setFDInfo/setFDenable**
 - If FDenable, FDclient detect face, 3A hal set FD info to Mgr , Mgr transfer FD ROI to CPU/CCU algo
- **setAEMeteringArea**
 - When 3A hal receive touch ROI, Mgr transfer to CPU/CCU algo, (touch AE > Face AE)
- **setAEMinMaxFrameRate**
 - 3A hal receive min/max fps and send it to AEMgr, AeMgr will judge if it is exceed the limit fps , and sync it to AEpline
- **enableEISRecording**
 - If EIS on need to change AEpline, this API can be customized
- **getAOECompLVvalue**
 - API for getting Lv without flash(AWB)

API introduction

b. 3A hal

- **setAEFlickerMode**
 - 3A hal receive flicker mode from AP, tell mgr to change Pline
- **setAEAutoFlickerMode**
 - Flicker algo(FLKOBufMgr) calculate, tell mgr to change Pline
- **setAEEVCompIndex**
 - 3A hal receive(AP or special scene) EV change, tell Mgr & algo
- **setAELimiterMode**
 - 3A hal access panorama, tell mgr by this API
- **IsStrobeBVTrigger**
 - If need open flash, Compare BV from algo with BV from capture pline table
- **setAEMode**
 - AP Change AEmode, will call this API by 3A Hal

API introduction

c. Sensor/ISP

- **updateSensorbyI2C**
 - When CCU off, 3A hal call this API if IsNeedUpdateSensor is true, and then use AeSettingCPU(updateSensor) tell AAASensor update shutter/sensor gain/Max frame rate
- **UpdateSensorParams**
 - When AE mode off, 3A hal send manual expo setting to mgr by this API
- **updateAEInfo2ISP**
 - After AE calculating, update AE info for ISP module, if CCU on, call CCU algo API, else call CPU algo. After AE info/flare filled, call ISP API (setISPAEGain/setIspFlareGainOffset /setAEInfo)
- **updateISPNvramOBCIndex**
 - 3A hal receive ISP Nvram index changing require, Mgr will query OBCindex from OBC table, transfer it toCCU.

API introduction

d. CCU

- **CCUManualControl**
 - For **stereo** master/slave 3A hal set expo manually , Mgr send to CCU
 - Cmd:
adb setprop debug.sync2a.me.m 1 (master , s for slave)
adb setprop debug.sync2a.me.m.exp 30000 (30ms)
adb setprop debug.sync2a.me.m.gain 1024 (1x)
adb setprop debug.sync2a.me.m.isp 1024 (1x)
- **PresetControlCCU**
 - 3A hal Preset metadata (e.g. min/max fps/ISO/EVMetering Area...)
- **IsCCUAEInit**
 - CCU will often pause/restart , to avoid AE algo uninit/init not being switched often,use this API to judge if need init CCU algo
- **prepareCCUPvParam/ prepareCCUStartParam**
 - Set CCU start/perframe info to AeFlowCCU

API introduction

d. Mgr sync/customization

- **searchPreviewIndexLimit**
 - Capture table BV should \geq preview table, if not, Brightness of preview and capture maybe not the same, This API is used to adjust preview index to avoid preview table cannot suitable with capture.
- **ModifyCaptureParamByCustom**
 - 4-cell capture params customization
- **copyAEInfo2mgr / copyCCUAEInfo2mgr**
 - Copy CPU/CCU Algo info to AEmgr
- **prepareCapParams**
 - precapture AE stable, use this API handleAE calculate capture expo prams, and update Mgr capture params(CPU precapture run CPU)

API introduction

d. Mgr sync/customization

- **setNVRAMIndex / setCamScenarioMode**
- **ISP4.x** update AE tuning params use **setCamScenarioMode** change 7 Nvram params
- **ISP5.0** can add Nvram params dynamic, 3A Hal use setNVRAMIndex change AE tuning params
- **updateAEScenarioPline**
- **sensor mode** determine p-line table
- **updateAEScenarioMode**
- **ISP profile** determine p-line table
- **getDebugInfo**
- Update debug Info after CPU/CCU algo calculating, if ZSD capture, perframe call getDebugInfo let algo fill exif data, non-ZSD capture only fill one time @capture

Adb command

When you meet AE issue and need MTK check,

We appreciate you upload the **mtklog** & **screen recording** & **picture**(do not change their name) with the following adb cmd on.

	MT6771	Before MT6771
Android O	adb shell setprop debug.drv.ccu_drv 6 adb shell setprop debug.ccuif.ccu_drv 6 adb shell setprop debug.ae.enable 9 adb shell setprop debug.ae.plineinfo 1 adb shell setprop debug.aaa.pvlog.enable 1	adb shell setprop debug.ae_mgr.enable 1 adb shell setprop debug.aaa.pvlog.enable 1 adb shell setprop debug.ae.enable 9 adb shell setprop debug.ae.plineinfo 1
Android P	adb shell setprop vendor.debug.ae.enable 9 adb shell setprop vendor.debug.aaa.pvlog.enable 1	adb shell setprop vendor.debug.ae.enable 9 adb shell setprop vendor.debug.aaa.pvlog.enable 1