ZCU104(MPSoC) System Monitor Usage with Vitis

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Adaptive and Embedded Computing Group (AECG)

AMD
together we advance_

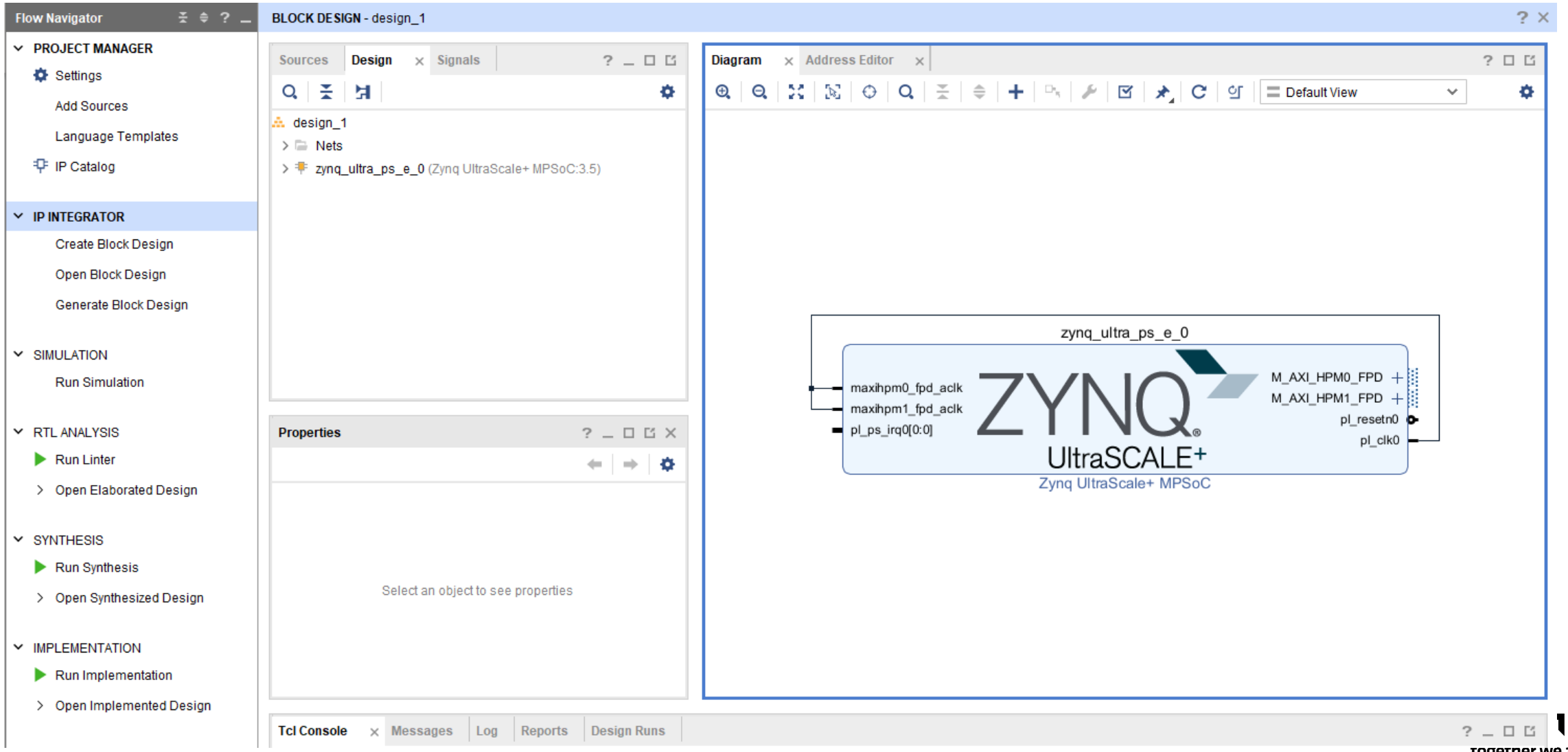
Revision History

Date	Version	Description
02/06/24	1.0	Initial version for flow introduction.

Vivado 2023.2 Part

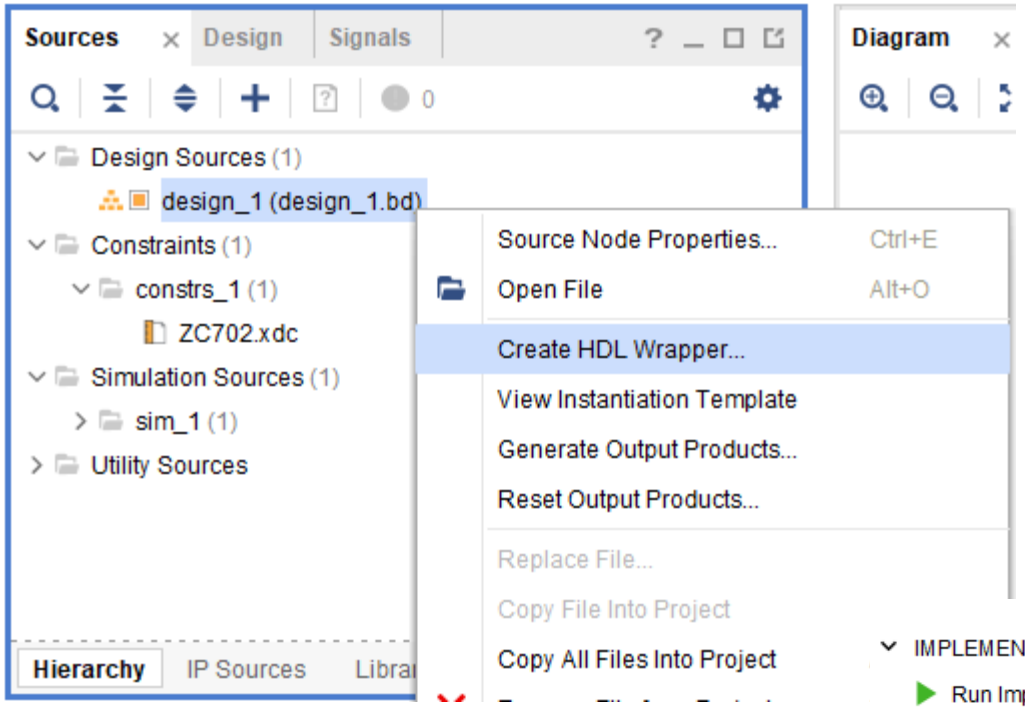
ZCU104(MPSoC) System Monitor Usage with Vitis

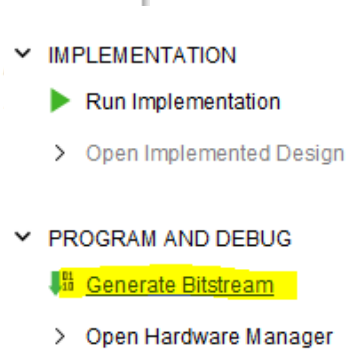
叫出 ZYNQ MPSoC IP 就好，我們要調用 PS 端而已

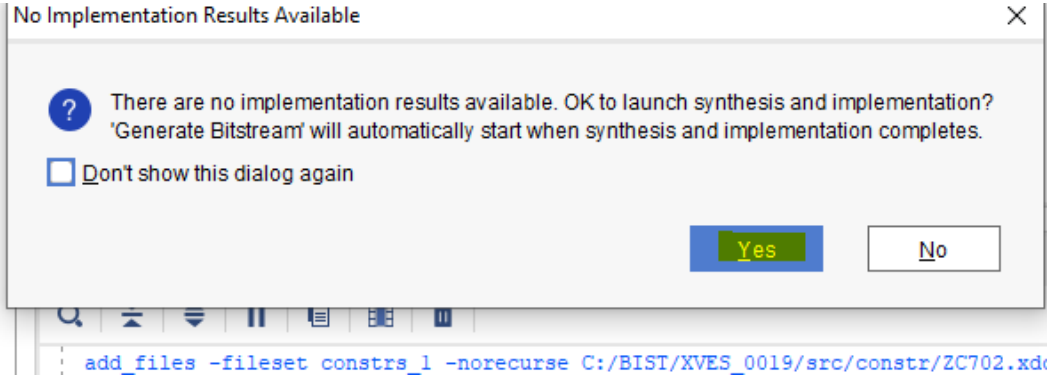


ZCU104(MPSoC) System Monitor Usage with Vitis

Block Design Steps








THIRTY-SEVEN
MINUTES
LATER...

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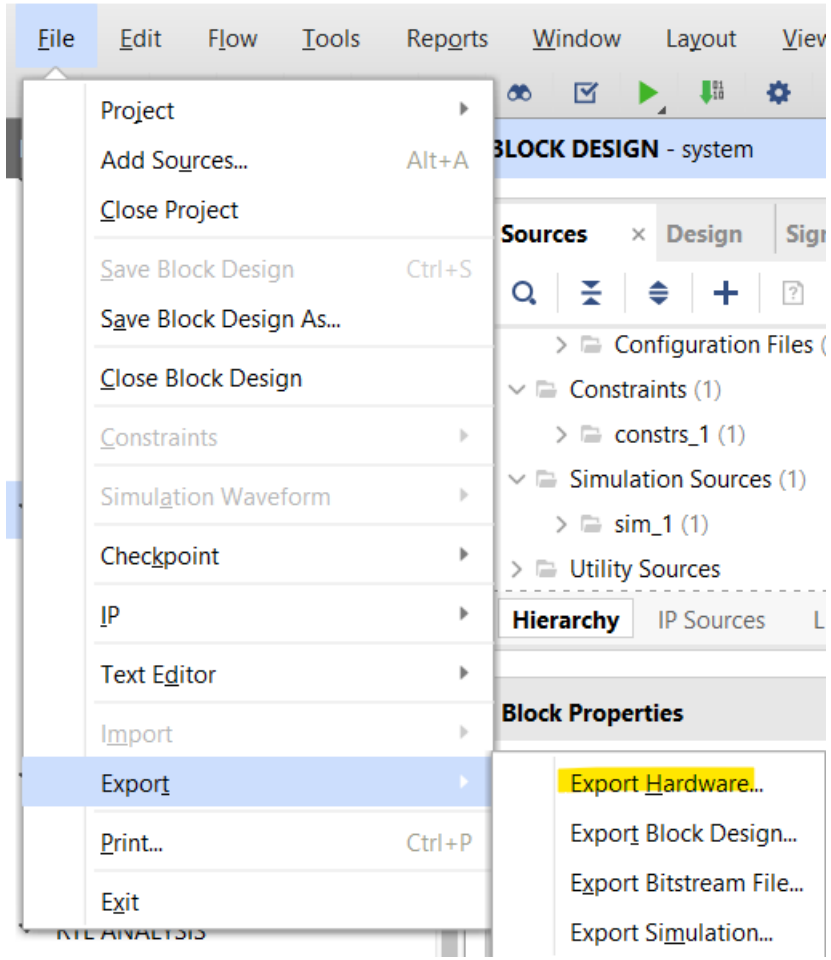

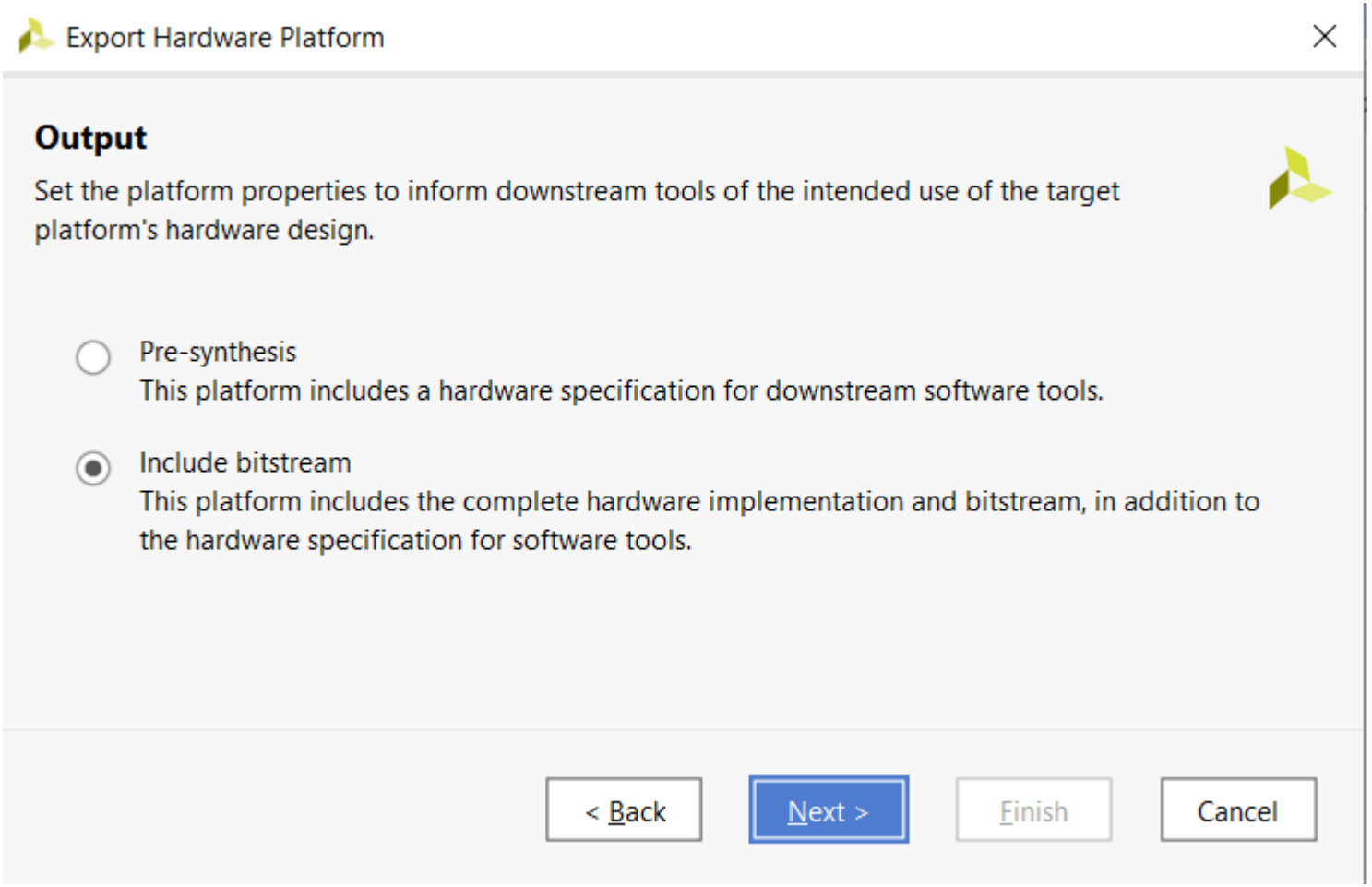

Vitis 2023.2 Part

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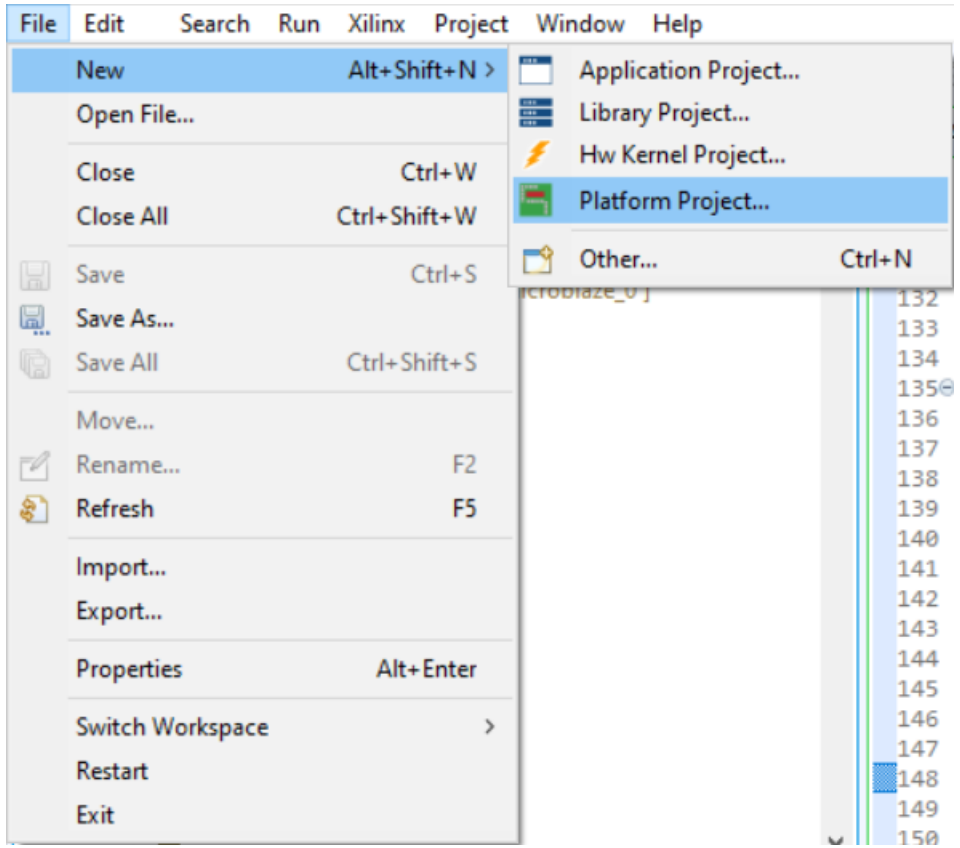
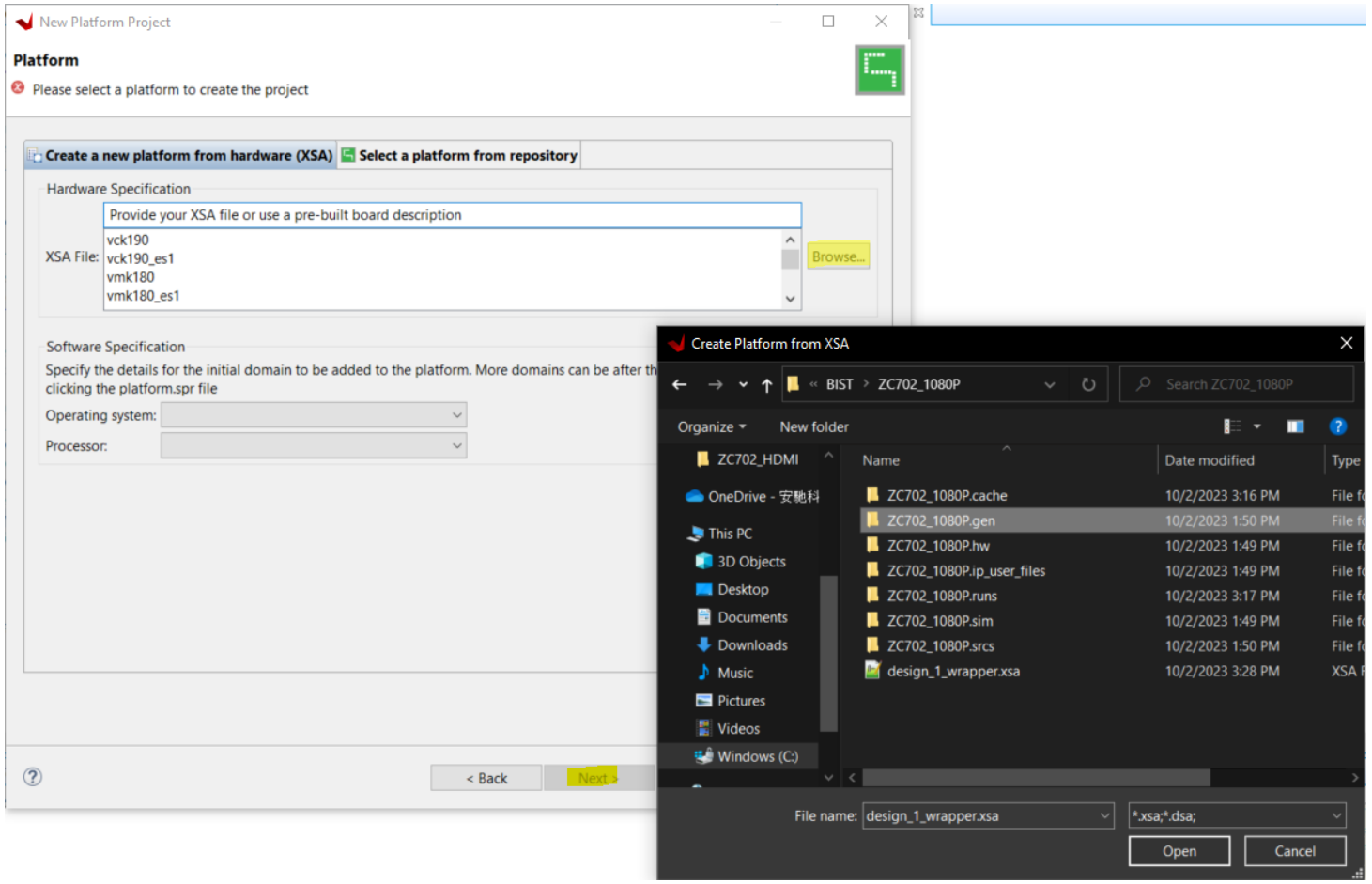
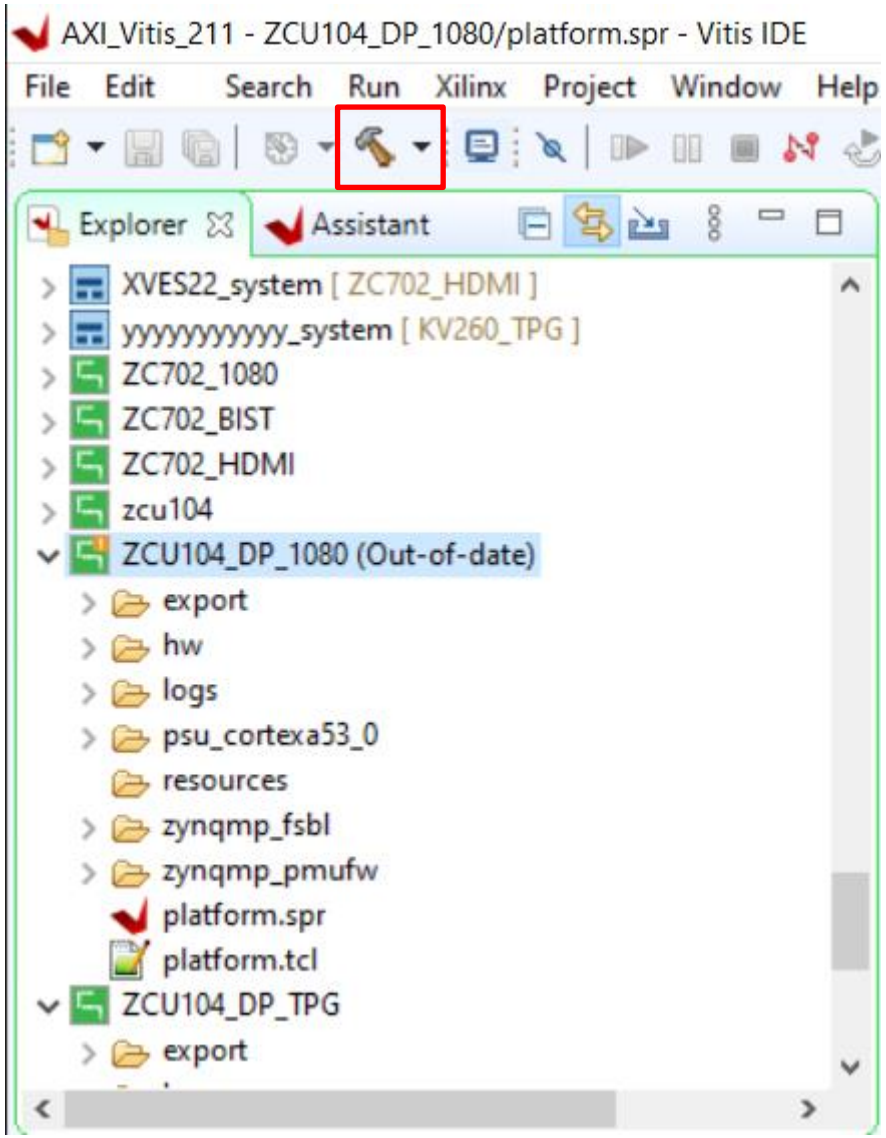




*** 實際檔案請按照自己設定的位置與名稱去開啟

ZCU104(MPSoC) System Monitor Usage with Vitis

記得 Build



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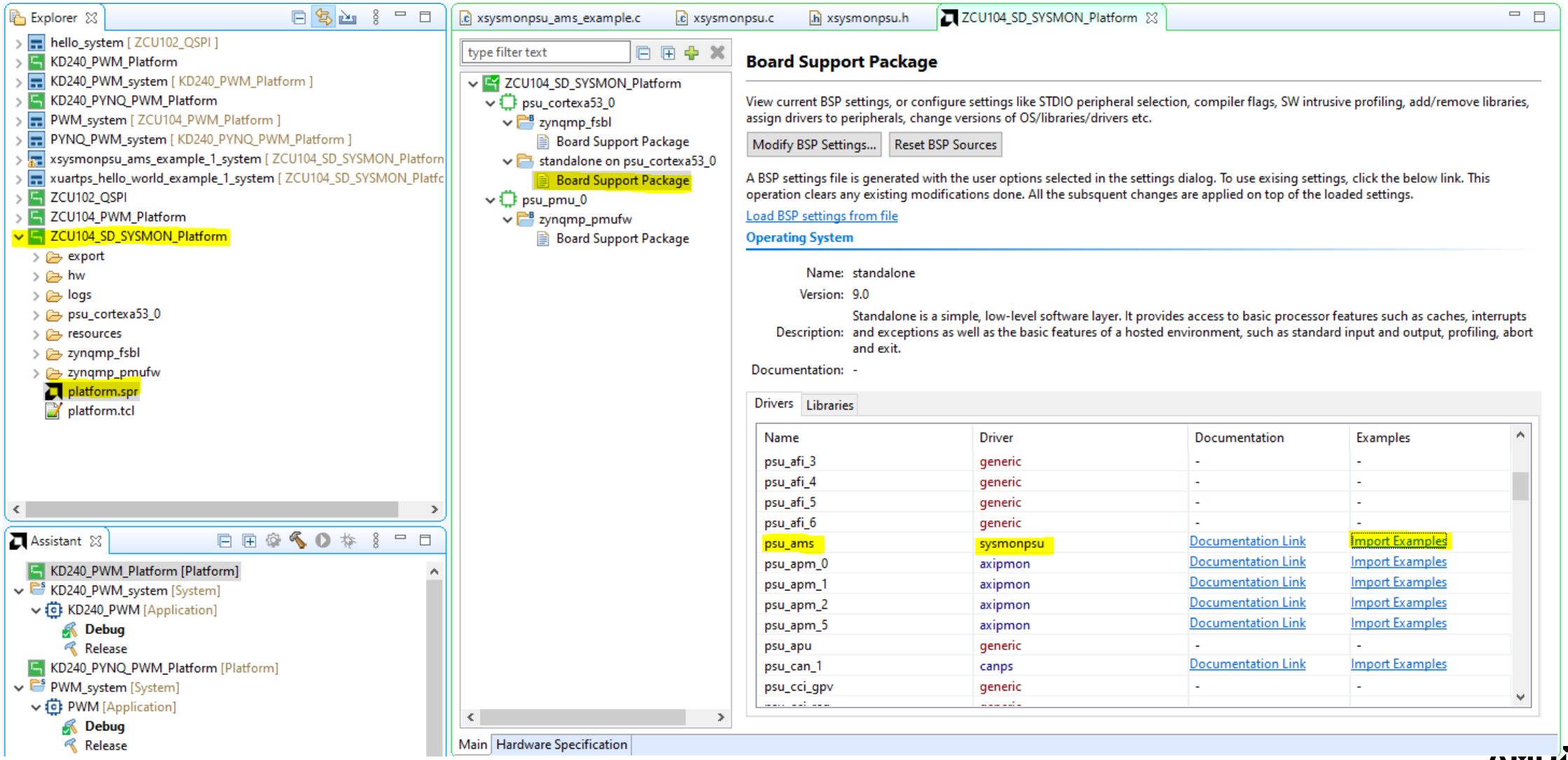
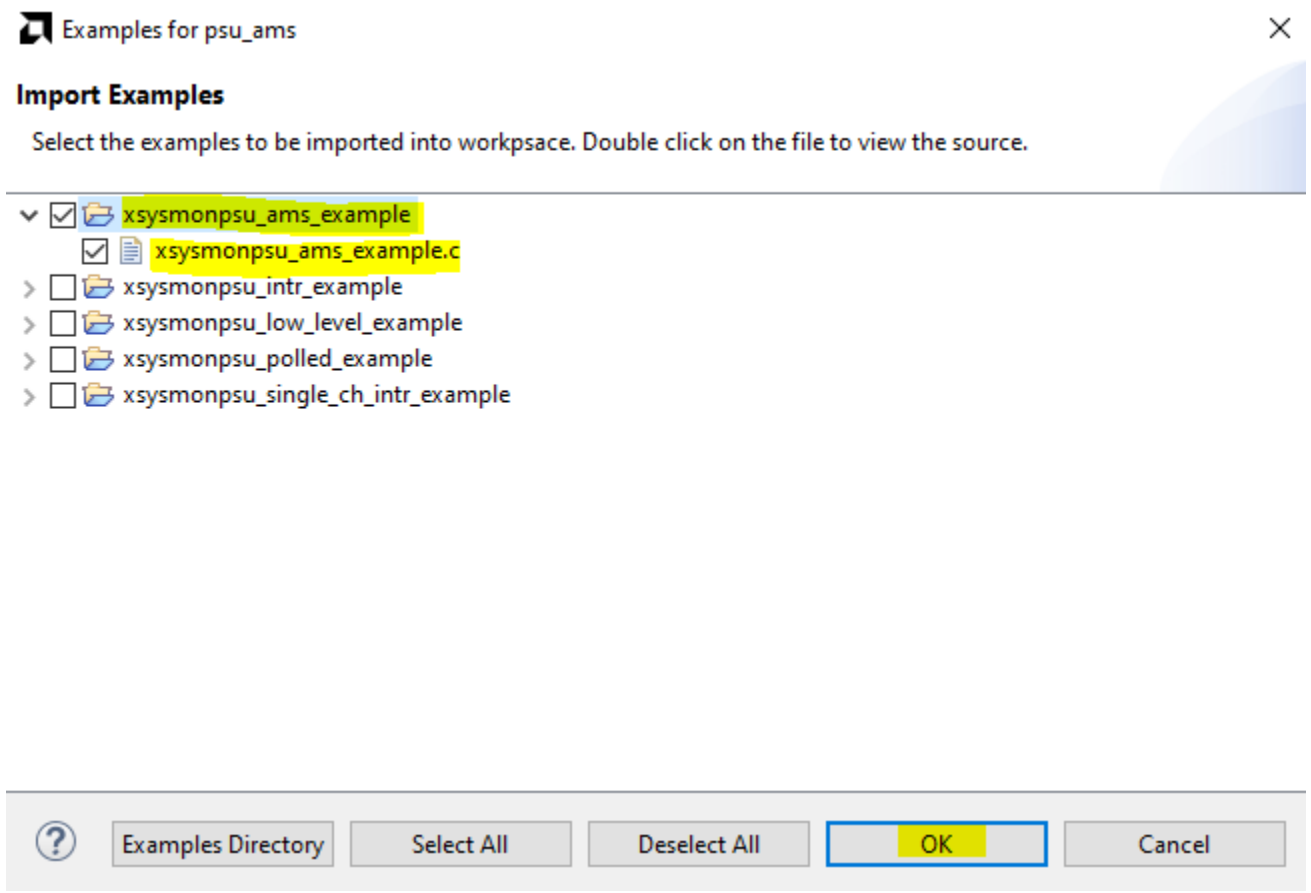
抓 PS SYSMON 的 example code 下來改



ZCU104(MPSoC) System Monitor Usage with Vitis

抓 PS SYSMON 的 example code 下來改



ZCU104(MPSoC) System Monitor Usage with Vitis

主要修改 SysMonPsuAMSExample 這個 Function

```
int SysMonPsuAMSExample(XScuGic* XScuGicInstancePtr,
                        XSysMonPsu* SysMonInstPtr,
                        u32 SysMonDeviceId,
                        u16 SysMonIntrId)
{
    int Status;
    XSysMonPsu_Config *ConfigPtr;

    s32 TempRawData;
    u32 VccPSIO1RawData;
    u32 VccAuxRawData;
    u32 VccPSDDRRawData;
    u32 VccPSINTLPRawData;
    u32 PLVPVNRawData;

    int pass_time;
    int days;
    int hours;
    int minutes;
    int seconds;

    float TempData;
    float VccPSIO1Data;
    float VccAuxData;
    float VccPSDDRData;
    float VccPSINTLPData;
    float PLVPVNData;

    XTime tEnd, tStart;
    u64 IntrStatus;

    /* Initialize the SysMon driver. */
    ConfigPtr = XSysMonPsu_LookupConfig(SysMonDeviceId);
    if (ConfigPtr == NULL) {
        return XST_FAILURE;
    }
```

ZCU104(MPSoC) System Monitor Usage with Vitis

當然跟使用一般 IP 一樣，要先 instance SysMon，Configure SysMon，Get SysMon DeviceID 等等

```
#include "xsysmonpsu.h"
```

```
#ifndef SDT
#define SYSMON_DEVICE_ID     XPAR_XSYSMONPSU_0_DEVICE_ID
#else
#define SYSMON_DEVICE_ID     0xffa50000
```

設定 Device ID

```
…
static XSysMonPsu SysMonInst;                /* System Monitor driver instance */
…
int SysMonPsuAMSExample(XScuGic* XScuGicInstancePtr,
                        XSysMonPsu* SysMonInstPtr,
                        u32 SysMonDeviceId,
                        u16 SysMonIntrId)
{
```

```
XSysMonPsu_Config *ConfigPtr;

/* Initialize the SysMon driver. */
ConfigPtr = XSysMonPsu_LookupConfig(SysMonDeviceId);
if (ConfigPtr == NULL) {
        return XST_FAILURE;
}
XSysMonPsu_CfgInitialize(SysMonInstPtr, ConfigPtr, ConfigPtr->BaseAddress);
```

抓 Device ID，然後 Config

```
/* Self Test the System Monitor device. */
Status = XSysMonPsu_SelfTest(SysMonInstPtr);
if (Status != XST_SUCCESS) {
        return XST_FAILURE;
}
```

先測看看 SYSMON 會不會通

```
/* Clear any bits set in the Interrupt Status Register. */
IntrStatus = XSysMonPsu_IntrGetStatus(SysMonInstPtr);
XSysMonPsu_IntrClear(SysMonInstPtr, IntrStatus);

/* Set the sequencer in Single channel mode. */
XSysMonPsu_SetSequencerMode(SysMonInstPtr, XSM_SEQ_MODE_SINGCHAN, XSYSMON_PS);

}
```

清掉 interrupt register 以進行下一個選項的觀測，
每次只觀測一個選項

ZCU104(MPSoC) System Monitor Usage with Vitis

以 VCC_PSBATT 為例

```
/*
 * Set the configuration registers for single channel continuous mode
 * of operation for the VCC_PSBATT channel.
 */
Status=  XSysMonPsu_SetSingleChParams(SysMonInstPtr, XSM_CH_RESERVE1,
                    FALSE, FALSE, FALSE, XSYSMON_PS);
if(Status != XST_SUCCESS) {
    return XST_FAILURE;
}
```

設定要觀測的項目，可以從兩個參數去做參考

```
XSysmonPsu_Poll_timeout(SysMonInstPtr->Config.BaseAddress +
        XSYSMONPSU_ISR_1_OFFSET, &IntrStatus,
        (IntrStatus & XSYSMONPSU_ISR_1_EOC_MASK) == XSYSMONPSU_ISR_1_EOC_MASK,
        EOC_POLLING_TIMEOUT);

xil_printf("\r\n8. EOC: %s , VCC_PSINTFP_DDR: ", (IntrStatus & 0x8) ? "Done" : "Timeout");
```

測試有沒有 Timout，可以省略

```
VccPsIntFpRawData = XSysMonPsu_GetAdcData(SysMonInstPtr, XSM_CH_RESERVE1, XSYSMON_AMS);
if (VccPsIntFpRawData == 0U)
    return XST_FAILURE;
```

抓 VCC_PSBATT 在 AMS 上的 RawData

```
VccPsIntFpData = XSysMonPsu_RawToVoltage(VccPsIntFpRawData);
xil_printf("%0d.%03d Volts\r\n", (int)(VccPsIntFpData), SysMonPsuFractionToInt(VccPsIntFpData));
```

把 RawData 轉成電壓值

```
/* Set the sequencer in Single channel mode. */
XSysMonPsu_SetSequencerMode(SysMonInstPtr, XSM_SEQ_MODE_SINGCHAN, XSYSMON_PS);

/* Clear any bits set in the Interrupt Status Register. */
IntrStatus = XSysMonPsu_IntrGetStatus(SysMonInstPtr);
XSysMonPsu_IntrClear(SysMonInstPtr, IntrStatus);
```

ZCU104(MPSoC) System Monitor Usage with Vitis

以 VCC_PSBATT 為例

```c
/*
 * Set the configuration registers for single channel continuous mode
 * of operation for the VCC_PSBATT channel.
 */
Status=  XSysMonPsu_SetSingleChParams(SysMonInstPtr, XSM_CH_RESERVE1,
                    FALSE, FALSE, FALSE, XSYSMON_PS);
if(Status != XST_SUCCESS) {
    return XST_FAILURE;
}

XSysmonPsu_Poll_timeout(SysMonInstPtr->Config.BaseAddress +
        XSYSMONPSU_ISR_1_OFFSET, &IntrStatus,
        (IntrStatus & XSYSMONPSU_ISR_1_EOC_MASK) == XSYSMONPSU_ISR_
        EOC_POLLING_TIMEOUT);

xil_printf("\r\n8. EOC: %s , VCC_PSINTFP_DDR: ", (IntrStatus & 0x8) ? "Done" : "Timeout");

VccPsIntFpRawData = XSysMonPsu_GetAdcData(SysMonInstPtr, XSM_CH_RESERVE1, XSYSMON_AMS);
if (VccPsIntFpRawData == 0U)
    return XST_FAILURE;

VccPsIntFpData = XSysMonPsu_RawToVoltage(VccPsIntFpRawData);
xil_printf("%0d.%03d Volts\r\n", (int)(VccPsIntFpData), SysMonPsuFractionToInt(VccPsIntFpData));

/* Set the sequencer in Single channel mode. */
XSysMonPsu_SetSequencerMode(SysMonInstPtr, XSM_SEQ_MODE_SINGCHAN, XSYSMON_PS);

/* Clear any bits set in the Interrupt Status Register. */
IntrStatus = XSysMonPsu_IntrGetStatus(SysMonInstPtr);
XSysMonPsu_IntrClear(SysMonInstPtr, IntrStatus);
```

```c
/* BaseAddress Offsets */
#define XSYSMON_PS 1U
#define XSYSMON_PL 2U
#define XSYSMON_AMS 3U
#define XPS_BA_OFFSET    0x00000800U
#define XPL_BA_OFFSET    0x00000C00U
#define XSM_ADC_CH_OFFSET 0x00000200U
#define XSM_AMS_CH_OFFSET 0x00000060U
#define XSM_MIN_MAX_CH_OFFSET 0x00000080U
```

```c
/**
 * @name Indexes for the different channels.
 * @{
 */
#define XSM_CH_TEMP         0x0U  /**< On Chip Temperature */
#define XSM_CH_SUPPLY1      0x1U  /**< SUPPLY1 VCC_PSINTLP */
#define XSM_CH_SUPPLY2      0x2U  /**< SUPPLY2 VCC_PSINTFP */
#define XSM_CH_VPVN         0x3U  /**< VP/VN Dedicated analog inputs */
#define XSM_CH_VREFP        0x4U  /**< VREFP */
#define XSM_CH_VREFN        0x5U  /**< VREFN */
#define XSM_CH_SUPPLY3      0x6U  /**< SUPPLY3 VCC_PSAUX */
#define XSM_CH_SUPPLY_CALIB 0x08U /**< Supply Calib Data Reg */
#define XSM_CH_ADC_CALIB    0x09U /**< ADC Offset Channel Reg */
#define XSM_CH_GAINERR_CALIB    0x0AU /**< Gain Error Channel Reg  */
#define XSM_CH_SUPPLY4      0x0DU /**< SUPPLY4 VCC_PSDDR_504 */
#define XSM_CH_SUPPLY5      0x0EU /**< SUPPLY5 VCC_PSIO3_503 */
#define XSM_CH_SUPPLY6      0x0FU /**< SUPPLY6 VCC_PSIO0_500 */
#define XSM_CH_AUX_MIN      16U   /**< Channel number for 1st Aux Channel */
#define XSM_CH_AUX_MAX      31U   /**< Channel number for Last Aux channel */
#define XSM_CH_SUPPLY7      32U   /**< SUPPLY7 VCC_PSIO1_501 */
#define XSM_CH_SUPPLY8      33U   /**< SUPPLY8 VCC_PSIO2_502 */
#define XSM_CH_SUPPLY9      34U   /**< SUPPLY9 PS_MGTRAVCC */
#define XSM_CH_SUPPLY10     35U   /**< SUPPLY10 PS_MGTRAVTT */
#define XSM_CH_VCCAMS       36U   /**< VCCAMS */
#define XSM_CH_TEMP_REMTE   37U   /**< Temperature Remote */
#define XSM_CH_VCC_PSLL0    48U   /**< VCC_PSLL0 */
#define XSM_CH_VCC_PSLL3    51U   /**< VCC_PSLL3 */
#define XSM_CH_VCCINT       54U   /**< VCCINT */
#define XSM_CH_VCCBRAM      55U   /**< VCCBRAM */
#define XSM_CH_VCCAUX       56U   /**< VCCAUX */
#define XSM_CH_VCC_PSDDRPLL 57U   /**< VCC_PSDDRPLL */
#define XSM_CH_DDRPHY_VREF  58U   /**< DDRPHY_VREF */
#define XSM_CH_RESERVE1     63U   /**< PSGT_AT0 */
```

ZCU104(MPSoC) System Monitor Usage with Vitis

以溫度為例

```
//Temperature
Status=  XSysMonPsu_SetSingleChParams(SysMonInstPtr, XSM_CH_TEMP, FALSE, FALSE, FALSE, XSYSMON_PS);

TempRawData = XSysMonPsu_GetAdcData(SysMonInstPtr, XSM_CH_TEMP, XSYSMON_PS);
if (TempRawData == 0U)
    return XST_FAILURE;

TempData = XSysMonPsu_RawToTemperature_OnChip(TempRawData);

/* Set the sequencer in Single channel mode. */
XSysMonPsu_SetSequencerMode(SysMonInstPtr, XSM_SEQ_MODE_SINGCHAN, XSYSMON_PS);

/* Clear any bits set in the Interrupt Status Register. */
IntrStatus = XSysMonPsu_IntrGetStatus(SysMonInstPtr);
XSysMonPsu_IntrClear(SysMonInstPtr, IntrStatus);
```

把 RawData 轉成溫度值

ZCU104(MPSoC) System Monitor Usage with Vitis

因此可以透過以上流程和 example code，將自己想要觀測的照參數填寫進去，最後再 xil_printf 出來

```
//PSIO1_Data
Status=  XSysMonPsu_SetSingleChParams(SysMonInstPtr, XSM_CH_SUPPLY7, FALSE, FALSE, FALSE, XSYSMON_PS);


VccPSIO1RawData = XSysMonPsu_GetAdcData(SysMonInstPtr, XSM_CH_SUPPLY7, XSYSMON_PS);
if (VccPSIO1RawData == 0U)
    return XST_FAILURE;

VccPSIO1Data = XSysMonPsu_RawToVoltage(VccPSIO1RawData);

/* Set the sequencer in Single channel mode. */
XSysMonPsu_SetSequencerMode(SysMonInstPtr, XSM_SEQ_MODE_SINGCHAN, XSYSMON_PS);

/* Clear any bits set in the Interrupt Status Register. */
IntrStatus = XSysMonPsu_IntrGetStatus(SysMonInstPtr);
XSysMonPsu_IntrClear(SysMonInstPtr, IntrStatus);



/*
 * Set the configuration registers for single channel continuous mode
 * of operation for the VCC_PSBATT channel.
 */
Status=  XSysMonPsu_SetSingleChParams(SysMonInstPtr, XSM_CH_VCCAUX,
                    FALSE, FALSE, FALSE, XSYSMON_PS);

VccAuxRawData = XSysMonPsu_GetAdcData(SysMonInstPtr, XSM_CH_VCCAUX, XSYSMON_PS);
if (VccAuxRawData == 0U)
    return XST_FAILURE;

VccAuxData = XSysMonPsu_RawToVoltage(VccAuxRawData);

/* Set the sequencer in Single channel mode. */
XSysMonPsu_SetSequencerMode(SysMonInstPtr, XSM_SEQ_MODE_SINGCHAN, XSYSMON_PS);

/* Clear any bits set in the Interrupt Status Register. */
IntrStatus = XSysMonPsu_IntrGetStatus(SysMonInstPtr);
XSysMonPsu_IntrClear(SysMonInstPtr, IntrStatus);
```

```
xil_printf("=====================================================\n\r"
        "Current Temperature: %0d.%03d Centigrades\n\r"
        "PSIO1: %0d.%03d Volts\n\r"
        "VCCAUX: %0d.%03d Volts\n\r"
        "VccPSDDR: %0d.%03d Volts\n\r"
        "VccPSINTLP: %0d.%03d Volts\n\r"
        "PLVPVN: %0d.%03d Volts\n\r",
        (int)(TempData), SysMonPsuFractionToInt(TempData), (int)(VccPSIO1Data),
        SysMonPsuFractionToInt(VccPSIO1Data),
        (int)(VccAuxData), SysMonPsuFractionToInt(VccAuxData),
        (int)(VccPSDDRData), SysMonPsuFractionToInt(VccPSDDRData),
        (int)(VccPSINTLPData), SysMonPsuFractionToInt(VccPSINTLPData),
        (int)(PLVPVNData), SysMonPsuFractionToInt(PLVPVNData));
```

ZCU104(MPSoC) System Monitor Usage with Vitis

寫法二 - 第一種寫法在長時間執行會有 Crash 現象發生

```
ConfigPtr = XSysMonPsu_LookupConfig(SysMonDeviceId);

if (ConfigPtr == NULL) {
  return XST_FAILURE;
}

XSysMonPsu_CfgInitialize(SysMonInstPtr, ConfigPtr, ConfigPtr->BaseAddress);
```

一樣先做 initial 與 Config

```
XSysMonPsu_SetSequencerMode(SysMonInstPtr, XSM_SEQ_MODE_SAFE, XSYSMON_PS); //设置Sequence Mode为安全模式

XSysMonPsu_SetAlarmEnables(SysMonInstPtr, 0x0, XSYSMON_PS); //关闭寄存器1中指定信号的警报

XSysMonPsu_SetAvg(SysMonInstPtr, XSM_AVG_16_SAMPLES, XSYSMON_PS);          //设置采样16次后计算平均值

XSysMonPsu_SetSeqAvgEnables(SysMonInstPtr,
              XSYSMONPSU_SEQ_CH0_TEMP_MASK |             //使能Temp_LPD通道平均值测量
              XSYSMONPSU_SEQ_CH2_SUP7_MASK |             //使能VCCO_PSIO1通道平均值测量
              XSYSMONPSU_SEQ_CH0_SUP3_MASK |             //使能VCC_PSAUX通道平均值测量
              XSYSMONPSU_SEQ_CH0_SUP4_MASK |             //使能VCC_PSDDR通道平均值测量
              XSYSMONPSU_SEQ_CH0_SUP1_MASK |             //使能VCC_PSINTLP通道平均值测量
              XSYSMONPSU_SEQ_CH0_VP_VN_MASK,            //使能PL_VPVN通道平均值测量
              XSYSMON_PS);

XSysMonPsu_SetSeqChEnables(SysMonInstPtr,
              XSYSMONPSU_SEQ_CH0_TEMP_MASK |             //使能Temp_LPD通道平均值测量
              XSYSMONPSU_SEQ_CH2_SUP7_MASK |             //使能VCCO_PSIO1通道平均值测量
              XSYSMONPSU_SEQ_CH0_SUP3_MASK |             //使能VCC_PSAUX通道平均值测量
              XSYSMONPSU_SEQ_CH0_SUP4_MASK |             //使能VCC_PSDDR通道平均值测量
              XSYSMONPSU_SEQ_CH0_SUP1_MASK |             //使能VCC_PSINTLP通道平均值测量
              XSYSMONPSU_SEQ_CH0_VP_VN_MASK,            //使能PL_VPVN通道平均值测量
              XSYSMON_PS);

IntrStatus = XSysMonPsu_IntrGetStatus(SysMonInstPtr); //读中断状态寄存器
XSysMonPsu_IntrClear(SysMonInstPtr, IntrStatus);  //清除中断状态寄存器

XSysMonPsu_SetSequencerMode(SysMonInstPtr, XSM_SEQ_MODE_CONTINPASS, XSYSMON_PS);     //设定Sequence Mode为通道循环模式

while ((XSysMonPsu_IntrGetStatus(SysMonInstPtr) & ((u64)XSYSMONPSU_ISR_1_EOS_MASK<<32))!= ((u64)XSYSMONPSU_ISR_1_EOS_MASK<< 32));//等待EOS(end of sequence)发生

XTime_GetTime(&tStart);
```

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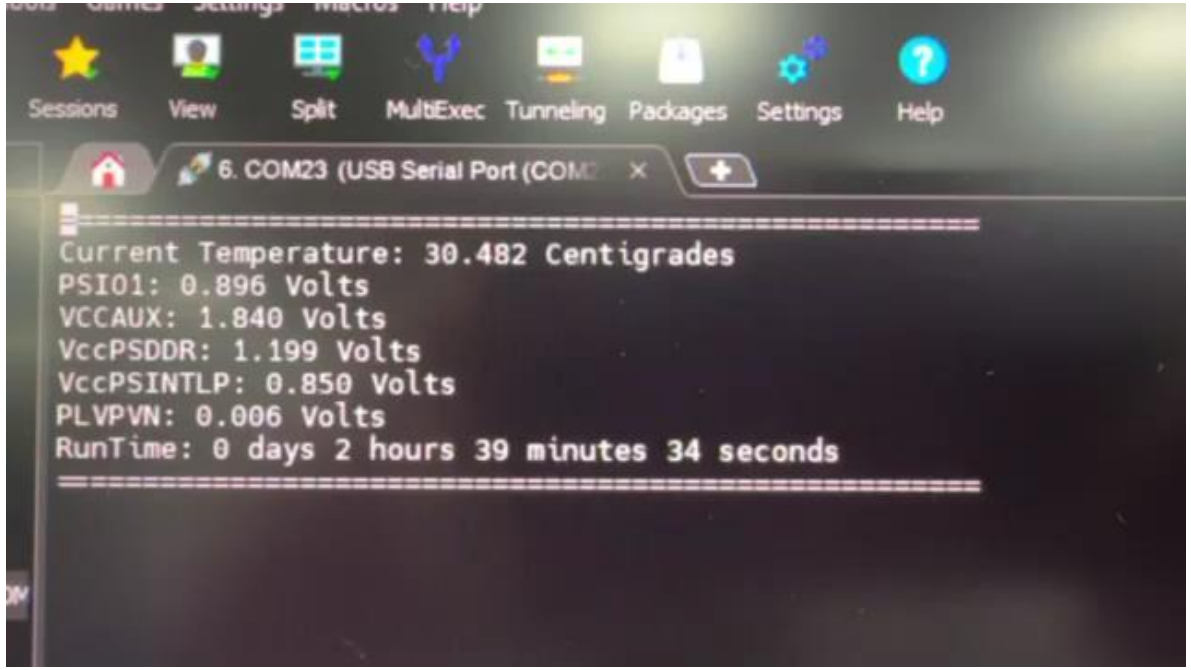
Result

```
==========================================
Current Temperature: 29.953 Centigrades
PSIO1: 0.896 Volts
VCCAUX: 1.840 Volts
VccPSDDR: 1.199 Volts
VccPSINTLP: 0.850 Volts
PLVPVN: 0.006 Volts
RunTime: 0 days 2 hours 39 minutes 0 secondss
==========================================
```



有加上運行時間顯示，使用 XTime_GetTime

```
#include "xtime_l.h"
#include "xil_io.h"
…
XTime tEnd, tStart;
…
XTime_GetTime(&tStart);
while(1){
XTime_GetTime(&tEnd);
…
pass_time = (int)((double)(tEnd - tStart) / (double)COUNTS_PER_SECOND);

days = pass_time / (60 * 60 * 24);
pass_time -= days * (60 * 60 * 24);
hours = pass_time / (60 * 60);
pass_time -= hours * (60 * 60);
minutes = pass_time / 60;
pass_time -= minutes * (60);
seconds = pass_time;

xil_printf("RunTime: %d days %d hours %d minutes %d seconds\n\r", days, hours,
minutes, seconds);
}
```

AMD

APPENDIX A: xil_printf vs printf

可以參考以下這篇，簡單來說 xil_printf 不支援 float

Which printf or xil_print? (xilinx.com)

barriet (Xilinx)

3 years ago

I'm not the expert here, but definitely also remember them NOT being the same.
A quick check of the current OS libraries reveals
/*
xil_printf
xil_printf() is a light-weight implementation of printf. It is much smaller in size (only 1 Kb). It does not have support for floating point numbers. xil_printf() also does not support printing of long (such as 64-bit) numbers.
...
*/
from https://www.xilinx.com/support/documentation/sw_manuals/xilinx2020_1/oslib_rm.pdf page 10.
Cheers,
bt

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oslib_rm-en-us-2023.2.pdf • 查看器 • AMD 自适应计算文档门户 (xilinx.com) page 10.