

Midterm Project Report

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1. Questions (Brief and concise explanation of one to two pages would be enough. You may use Chinese.)

- How do you design your accelerator? Please draw the FSM and block diagram to explain the overall architecture. (2%)

Ans:

依序經過 WAIT、READ、LENET、WRITE、DONE 五個 state

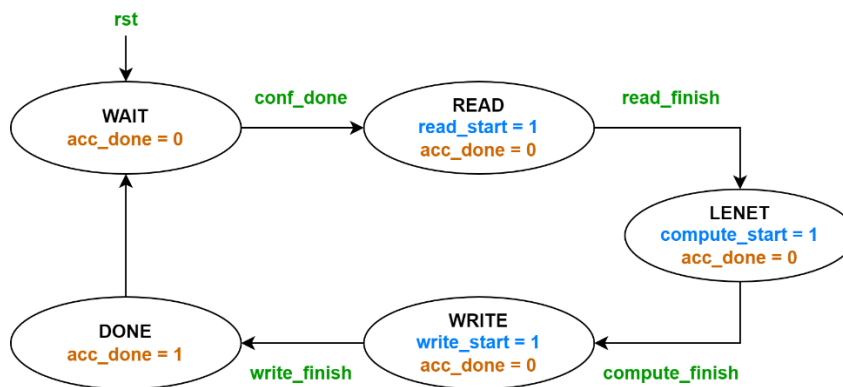
WAIT：等待 conf_done 變為 1

READ：dma_read 將資料由 DRAM 讀入 SRAM

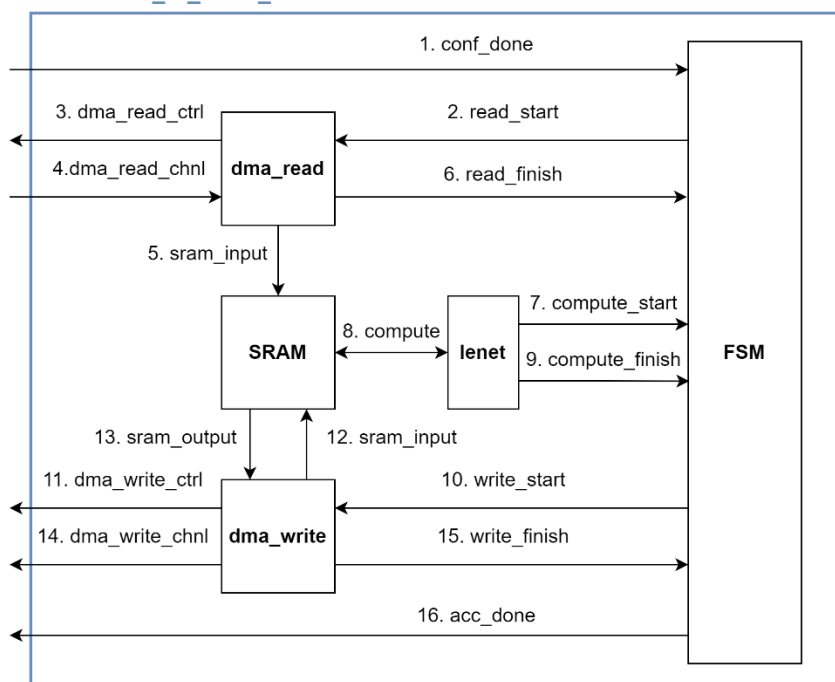
LENET：lenet 進行運算，從 SRAM 讀出所需資料，算完後再寫回 SRAM

WRITE：dma_write 將資料由 SRAM 寫入 DRAM

DONE：結束，將 acc_done 變為 1



lenet_rtl_basic_dma64

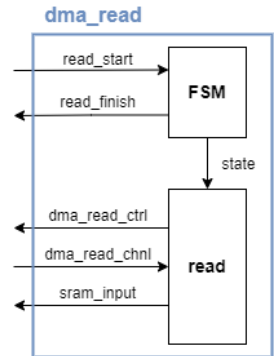
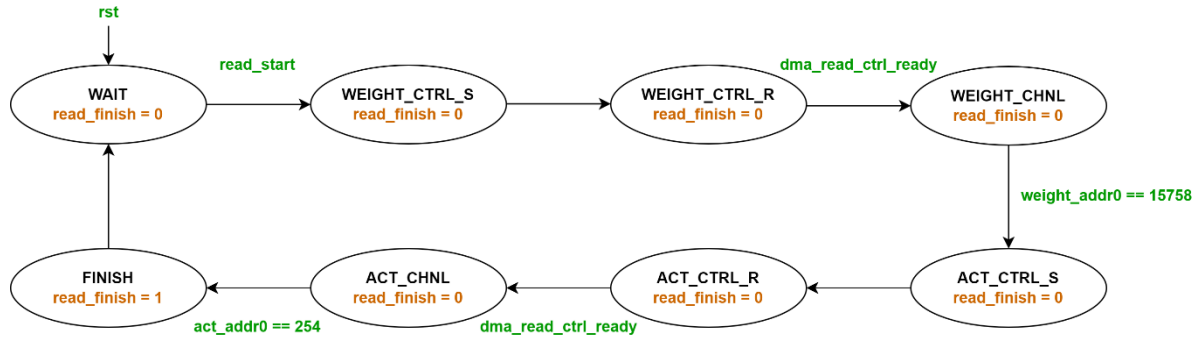


- How do you design your DMA controller interface to transfer data? Please draw the block diagram and FSM. (2%)

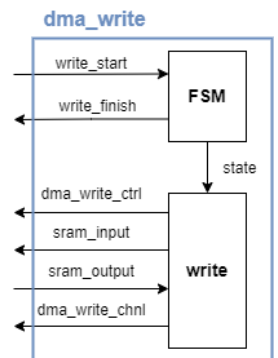
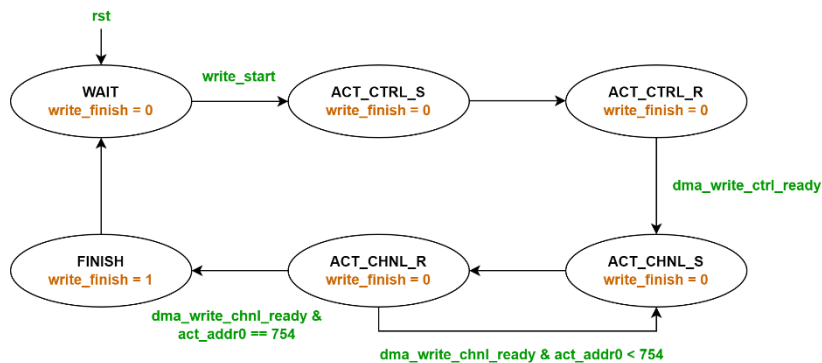
Ans:

分為 dma_read 與 dma_write 兩個 module

➤ dma_read :



➤ dma_write :



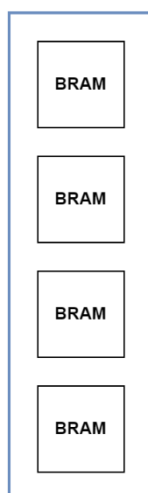
- How do you build two SRAMs in this project? Please draw the block diagram.(2%)

Ans:

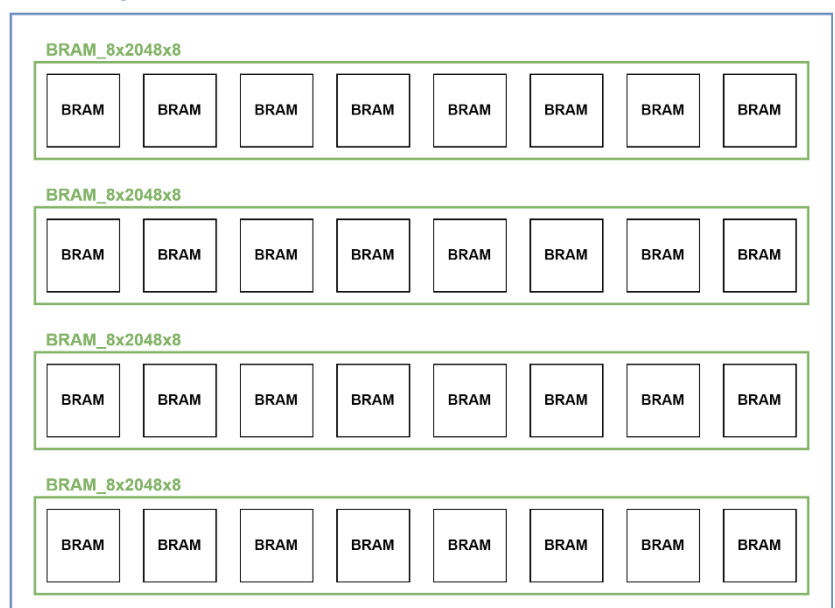
SRAM_activation_1024x32b 由 4 個 BRAM_2048x8 組成。

SRAM_weight_16384x32b 由 4 個 BRAM_8x2048x8 組成，BRAM_8x2048x8 則由 8 個 BRAM_2048x8 組成。

SRAM_activation_1024x32b



SRAM_weight_16384x32b



- Please briefly explain why we write images from mem[20000] to mem[20255], but read images from address 10000 to address 10127 in the accelerator? (2%)

Ans:

software 的 data width 為 32-bit，DMA 的 data width 則為 64-bit，因此讀取位址的算法為 $\lfloor 20000/2 \rfloor \sim \lfloor 20255/2 \rfloor$ 。

- What is the function of the following code? (1%)

```
iowrite32(dev, LENET_SCALE_CONV2_REG, scale_CONV2);
iowrite32(dev, LENET_SCALE_CONV3_REG, scale_CONV3);
iowrite32(dev, LENET_SCALE_CONV1_REG, scale_CONV1);
iowrite32(dev, LENET_SCALE_FC2_REG, scale_FC2);
iowrite32(dev, LENET_SCALE_FC1_REG, scale_FC1);
```

Ans:

將各層的 scale 寫入 register 中。

- What is the function of the following code? Please explain line by line (1%)

```
done = 0;
while (!done) {
    done = ioread32(dev, STATUS_REG);
    done &= STATUS_MASK_DONE;
}
iowrite32(dev, CMD_REG, 0x0);
```

Ans:

先把 done 設為 0，當 done 為 0 時，進入 while loop，讀出 STATUS_REG 的值並 & STATUS_MASK_DONE，取出 done 的值；當 done 不為 0 時，跳出 while loop，將 CMD_REG 寫入 0。

2. Result

Item	Description	Unit
RTL simulation	PASS	---

3. Others (optional)

- Suggestions or comments about this class to teacher or TA.