

MSOC HW2 Report

1-1

The interchange unit uses `direct_read()` and `direct_write()` functions to pass the pointer to its local memory.

```
class mem_if: virtual public sc_interface {
public:
    //Functional model
    virtual void direct_read (int** block) = 0;
    virtual void direct_write(int** block) = 0;

SC_MODULE(interchange){
    sc_port<mem_if> m_mem;

    SC_HAS_PROCESS(interchange);
    interchange(sc_module_name _name);

    void interchange_thread();

private:
    int **mem_inter;
};

void interchange::interchange_thread(){
    m_mem->direct_read(mem_inter);

    //write back
    m_mem->direct_write(mem_inter);
    m_mem->notify();
}
```

將記憶體位置的 pointer 傳入 interchange 做運算

```

C:\Users\The King of Loser\Desktop\problem_1_1\problem_1_1\Debug\problem_1_1.exe
ALL RIGHTS RESERVED
Original data in Memory.
[ 15 99 55 33 3 19 77 29 ]
[ 26 19 37 54 83 64 91 79 ]
[ 92 73 25 25 73 79 27 13 ]
[ 96 37 21 19 43 72 0 33 ]
[ 97 69 48 12 81 1 24 22 ]
[ 11 37 26 75 12 94 36 67 ]
[ 0 81 83 36 62 22 72 48 ]
[ 8 74 48 27 67 8 76 58 ]
INFO: Simulating problem_1_1
New data after interchange.
[ 58 48 67 22 33 13 79 29 ]
[ 76 72 36 24 0 27 91 77 ]
[ 8 22 94 1 72 79 64 19 ]
[ 67 62 12 81 43 73 83 3 ]
[ 27 36 75 12 19 25 54 33 ]
[ 48 83 26 48 21 25 37 55 ]
[ 74 81 37 69 37 73 19 99 ]
[ 8 0 11 97 96 92 26 15 ]
New data in Memory.
[ 58 48 67 22 33 13 79 29 ]
[ 76 72 36 24 0 27 91 77 ]
[ 8 22 94 1 72 79 64 19 ]
[ 67 62 12 81 43 73 83 3 ]
[ 27 36 75 12 19 25 54 33 ]
[ 48 83 26 48 21 25 37 55 ]
[ 74 81 37 69 37 73 19 99 ]
[ 8 0 11 97 96 92 26 15 ]
微軟注音 半：

```

1-2

The interchange unit uses `word_read()` and `word_write()` functions to copy data from and to memory. You may use delay notification to model the timing in interchange unit or channel.

```

class mem_if: virtual public sc_interface {
public:
    //Functional model
    //virtual void direct_read (int** block) = 0;
    //virtual void direct_write(int** block) = 0;

    virtual void word_read(unsigned x, unsigned y, int& d) = 0;
    virtual void word_write(unsigned x, unsigned y, int d) = 0;

    //delay notification
    virtual void notify() = 0;
    virtual const sc_event& default_event() const = 0;
};

void interchange::interchange_thread(){
    //m_mem->direct_read(mem_inter);
    for(int i = 0; i < 8; i++){
        for(int j = 0; j < 8; j++){
            m_mem->word_read(i, j, mem_inter[i][j]);
        }
    }
}

```

```

//write back
//m_mem->direct_write(mem_inter);
for(int i = 0; i < 8; i++){
    for(int j = 0; j < 8; j++){
        m_mem->word_write(i, j, mem_inter[i][j]);
    }
}
m_mem->notify();
}

```

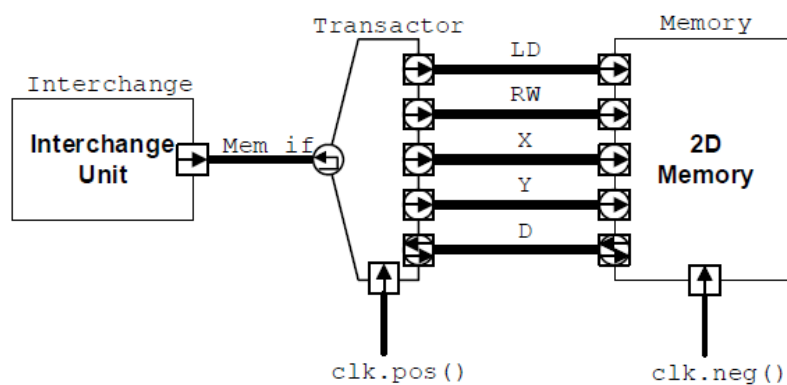
一次只從 memory 中讀取一個值或存取一個值，透過 notify()通知 memory 資料已寫入完畢。

```

C:\Users\The King of Loser\Desktop\problem_1_2\problem_1_2\Debug\problem_1_2.exe
[ 54 49 79 79 0 86 75 83 ]
[ 7 41 54 7 62 41 4 75 ]
[ 79 96 24 26 37 56 45 92 ]
[ 51 81 66 93 98 79 69 36 ]
[ 50 99 5 91 3 25 78 33 ]
[ 89 53 8 2 72 94 6 82 ]
[ 2 37 10 77 85 62 74 88 ]
INFO: Simulating problem_1_2
New data after interchange.
[ 88 82 33 36 92 75 83 54 ]
[ 74 6 78 69 45 4 75 99 ]
[ 62 94 25 79 56 41 86 45 ]
[ 85 72 3 98 37 62 0 56 ]
[ 77 2 91 93 26 7 79 70 ]
[ 10 8 5 66 24 54 79 62 ]
[ 37 53 99 81 96 41 49 48 ]
[ 2 89 50 51 79 7 54 3 ]
New data in Memory.
[ 88 82 33 36 92 75 83 54 ]
[ 74 6 78 69 45 4 75 99 ]
[ 62 94 25 79 56 41 86 45 ]
[ 85 72 3 98 37 62 0 56 ]
[ 77 2 91 93 26 7 79 70 ]
[ 10 8 5 66 24 54 79 62 ]
[ 37 53 99 81 96 41 49 48 ]
[ 2 89 50 51 79 7 54 3 ]
INFO: Post-processing problem_1_2
INFO: Simulation problem_1_2 PASSED with 0 errors
請按任意鍵繼續 . . .
微軟注音 半：

```

2-1



```

SC_MODULE(transactor), mem_if{
    sc_in_clk      clk;
    sc_out<bool>    LD;
    sc_out<bool>    RW;
    sc_out<unsigned> X;
    sc_out<unsigned> Y;
    sc_inout_rv<32> D;

```

```

void transactor::word_read(unsigned x, unsigned y, int& d)
{
    wait(clk->posedge_event());
    LD->write(true);
    RW->write(true);
    X->write(x);
    Y->write(y);
    wait(clk->posedge_event());
    LD->write(false);
    d = D->read().to_long();
}

```

```

void transactor::word_write(unsigned x, unsigned y, int d)
{
    wait(clk->posedge_event());
    LD->write(true);
    RW->write(false);
    X->write(x);
    Y->write(y);
    D->write(d);
    wait(clk->posedge_event());
    LD->write(false);
}

```

```

SC_MODULE(memory) {
    sc_in_clk      clk;
    sc_in<bool>     LD;
    sc_in<bool>     RW;
    sc_in<unsigned> X;
    sc_in<unsigned> Y;
    sc_inout_rv<32> D;

    SC_HAS_PROCESS(memory);

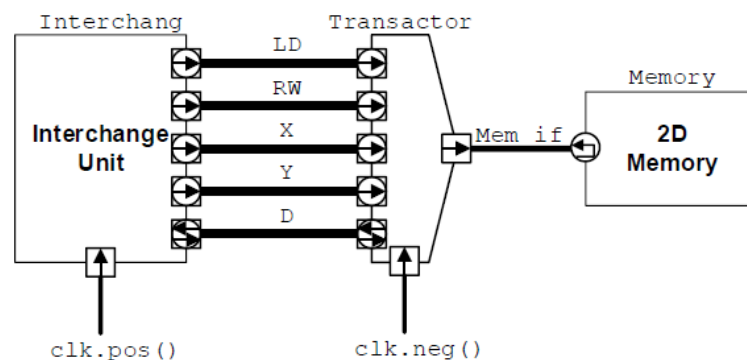
```

```

C:\Users\The King of Loser\Desktop\problem_2_1\problem_2_1\Debug\problem_2_1.exe
[ 7 84 37 88 21 89 90 88 ]
[ 67 93 79 50 57 20 23 47 ]
[ 21 95 42 33 13 7 20 59 ]
[ 81 61 69 37 67 75 21 61 ]
[ 82 86 5 50 37 14 47 88 ]
[ 76 5 99 52 11 0 75 98 ]
[ 62 78 97 96 41 90 81 72 ]
INFO: Simulating problem_2_1
New data after interchange.
[ 72 98 88 61 59 47 88 99 ]
[ 81 75 47 21 20 23 90 5 ]
[ 90 0 14 75 7 20 89 20 ]
[ 41 11 37 67 13 57 21 76 ]
[ 96 52 50 37 33 50 88 83 ]
[ 97 99 5 69 42 79 37 2 ]
[ 78 5 86 61 95 93 84 26 ]
[ 62 76 82 81 21 67 7 85 ]
New data in Memory.
[ 72 98 88 61 59 47 88 99 ]
[ 81 75 47 21 20 23 90 5 ]
[ 90 0 14 75 7 20 89 20 ]
[ 41 11 37 67 13 57 21 76 ]
[ 96 52 50 37 33 50 88 83 ]
[ 97 99 5 69 42 79 37 2 ]
[ 78 5 86 61 95 93 84 26 ]
[ 62 76 82 81 21 67 7 85 ]
INFO: Post-processing problem_2_1
INFO: Simulation problem_2_1 PASSED with 0 errors
請按任意鍵繼續 . . .
微軟注音 半：

```

2-2



```

SC_MODULE(interchange){
    //sc_port<mem_if> m_mem;
    sc_in_clk      clk;
    sc_out<bool>    LD;
    sc_out<bool>    RW;
    sc_out<unsigned> X;
    sc_out<unsigned> Y;
    sc_inout_rv<32> D;
}

```

```

SC_MODULE(transactor){
    sc_in_clk      clk;
    sc_in<bool>     LD;
    sc_in<bool>     RW;
    sc_in<unsigned> X;
    sc_in<unsigned> Y;
    sc_inout_rv<32> D;
    sc_port<mem_if> m_mem;
}

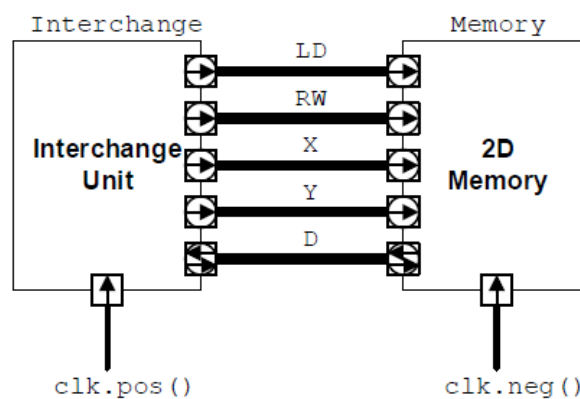
```

```

C:\Users\The King of Loser\Desktop\problem_2_2\problem_2_2\Debug\problem_2_2.exe
[ 93 88 40 55 76 56 6 65 ]
[ 64 92 33 99 84 0 10 38 ]
[ 40 10 89 22 32 80 27 15 ]
[ 61 70 90 86 78 31 89 0 ]
[ 87 68 9 84 18 47 60 99 ]
[ 56 56 88 37 23 14 8 29 ]
[ 19 88 1 90 17 85 7 44 ]
INFO: Simulating problem_2_2
New data after interchange.
[ 44 29 99 0 15 38 65 23 ]
[ 7 8 60 89 27 10 6 39 ]
[ 85 14 47 31 80 0 56 55 ]
[ 17 23 18 78 32 84 76 70 ]
[ 90 37 84 86 22 99 55 22 ]
[ 1 88 9 90 89 33 40 1 ]
[ 88 56 68 70 10 92 88 18 ]
[ 19 56 87 61 40 64 93 37 ]
New data in Memory.
[ 44 29 99 0 15 38 65 23 ]
[ 7 8 60 89 27 10 6 39 ]
[ 85 14 47 31 80 0 56 55 ]
[ 17 23 18 78 32 84 76 70 ]
[ 90 37 84 86 22 99 55 22 ]
[ 1 88 9 90 89 33 40 1 ]
[ 88 56 68 70 10 92 88 18 ]
[ 19 56 87 61 40 64 93 37 ]
INFO: Post-processing problem_2_2
INFO: Simulation problem_2_2 PASSED with 0 errors
請按任意鍵繼續 . . .
微軟注音 半：

```

2-3



```

SC_MODULE(interchange){
    //sc_port<mem_if>  tran_mem;
    sc_in_clk          clk;
    sc_out<bool>        LD;
    sc_out<bool>        RW;
    sc_out<unsigned>    X;
    sc_out<unsigned>    Y;
    sc_inout_rv<32>    D;
}

```

```

SC_MODULE(memory){
    sc_in_clk          clk;
    sc_in<bool>        LD;
    sc_in<bool>        RW;
    sc_in<unsigned>    X;
    sc_in<unsigned>    Y;
    sc_inout_rv<32>    D;
}

```

```
C:\Users\The King of Loser\Desktop\problem_2_3\problem_2_3\Debug\problem_2_3.exe
[ 37 57 45 59 44 58 95 25 ]
[ 14 7 54 47 78 2 13 76 ]
[ 11 9 26 27 10 31 83 13 ]
[ 53 58 90 46 6 21 71 19 ]
[ 7 0 99 75 30 88 50 53 ]
[ 43 57 57 34 54 81 90 76 ]
[ 98 98 31 25 35 99 81 88 ]
INFO: Simulating problem_2_3
New data after interchange.
[ 88 76 53 19 13 76 25 30 ]
[ 81 90 50 71 83 13 95 78 ]
[ 99 81 88 21 31 2 58 40 ]
[ 35 54 30 6 10 78 44 52 ]
[ 25 34 75 46 27 47 59 97 ]
[ 31 57 99 90 26 54 45 1 ]
[ 98 57 0 58 9 7 57 37 ]
[ 98 43 7 53 11 14 37 87 ]
New data in Memory.
[ 88 76 53 19 13 76 25 30 ]
[ 81 90 50 71 83 13 95 78 ]
[ 99 81 88 21 31 2 58 40 ]
[ 35 54 30 6 10 78 44 52 ]
[ 25 34 75 46 27 47 59 97 ]
[ 31 57 99 90 26 54 45 1 ]
[ 98 57 0 58 9 7 57 37 ]
[ 98 43 7 53 11 14 37 87 ]
INFO: Post-processing problem_2_3
INFO: Simulation problem_2_3 PASSED with 0 errors
請按任意鍵繼續 . . .
微軟主音 半 :
```