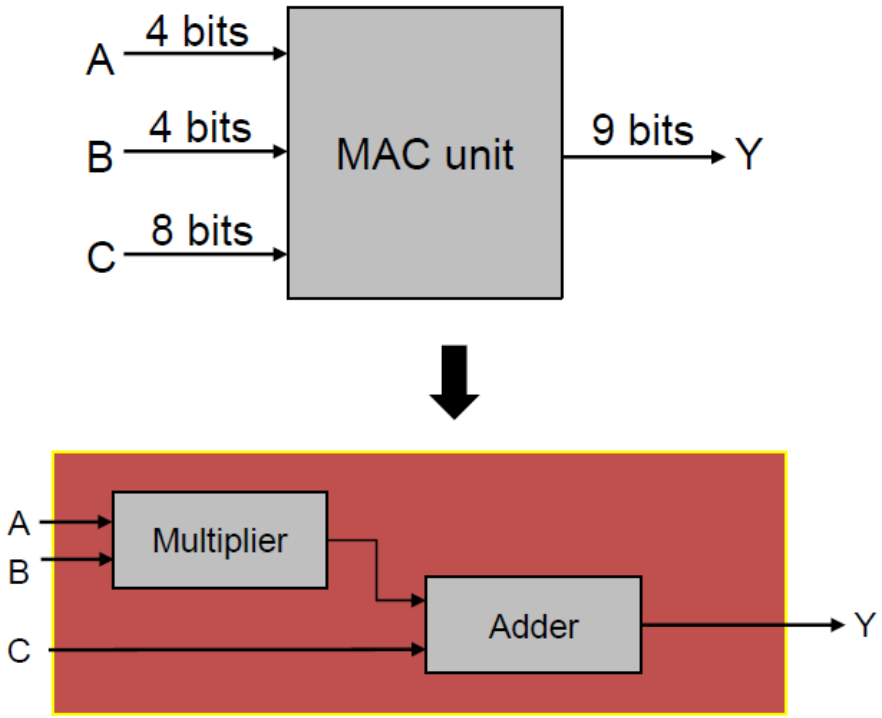
Lab1: Multiply Accumulation Unit Design with SystemC

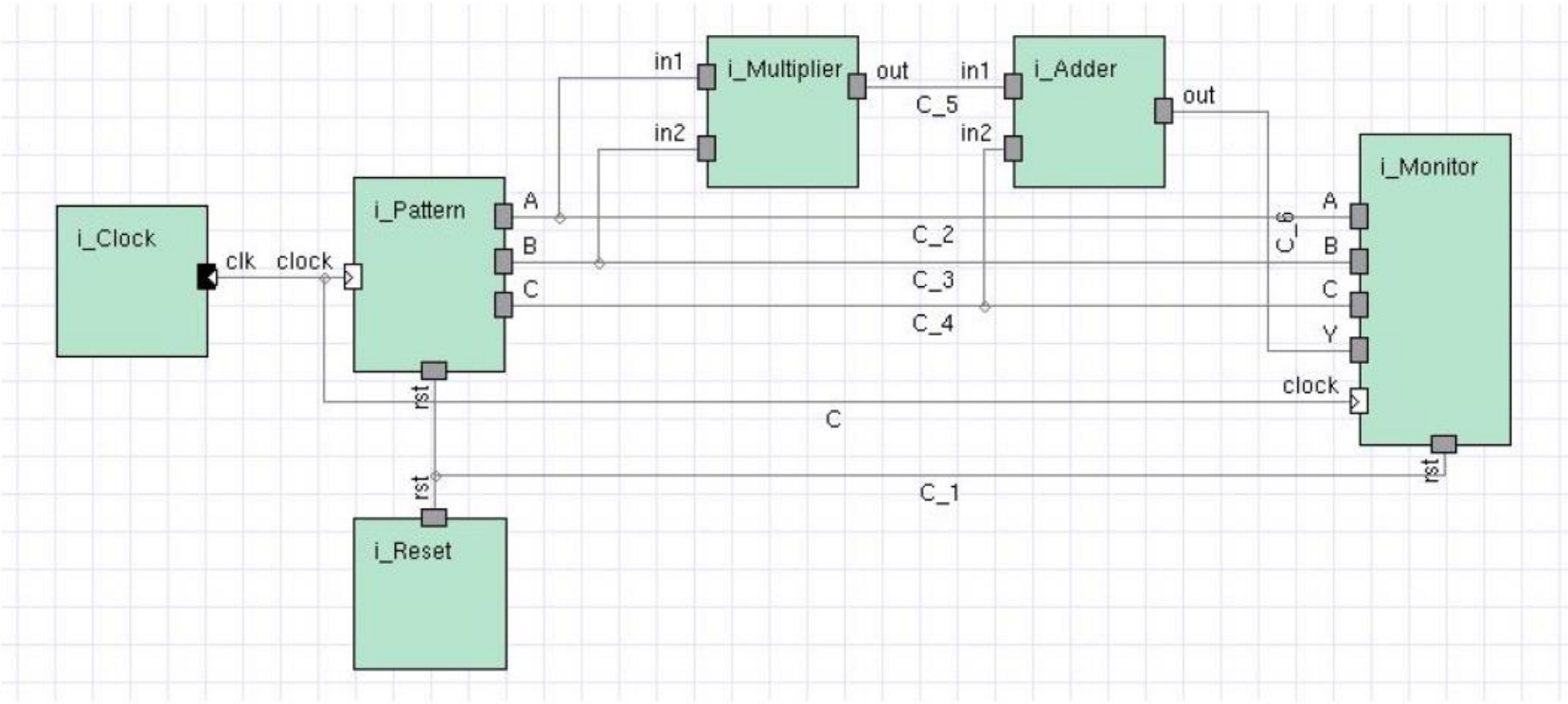
Machine Learning Intelligent Chip Design
2024 Spring

Introduction

- Design a multiply accumulate unit
  - $Y = A \times B + C$



Block Diagram



SystemC

- Source file
  - xxx.h
  - xxx.cpp
  - Main.cpp

- Makefile
  - Compile the source file

```
HOME = /RAID2/COURSE/mlchip/mlchipTA01
LIB_DIR=$(HOME)/systemc-2.3.3/lib-linux64
INC_DIR=$(HOME)/systemc-2.3.3/include
LIB=-lsystemc-2.3.3
RPATH=-Wl,-rpath,$(HOME)/systemc-2.3.3/lib-linux64

# export SYSTEMC_HOME=/usr/local/systmec-2.3.4
# export LD_LIBRARY_PATH=$(SYSTEMC_HOME)/lib-linux64

O = run
C = *.cpp

all:
        g++ -I . -I  $(INC_DIR) -L . -L $(LIB_DIR) -o $(O) $(C) $(LIB) $(RPATH)
        ./run

clean:
        rm -rf $(O)
```

SystemC

- Edit your source code by editor (e.g., notepad++,…)
  - MAC.h

```
SC_MODULE( Adder ) {
    sc_in < sc_uint<8> > in1,in2;
    sc_out < sc_uint<9> > out;

    void run() {
        // vvvvv put your code here vvvvv

        // ^^^^^ put your code here ^^^^^
    }

    SC_CTOR( Adder ) {
        SC_METHOD( run );
        sensitive << in1 << in2;
    }

};
```

```
SC_MODULE( Multiplier ) {
    sc_in < sc_uint<4> > in1,in2;
    sc_out < sc_uint<8> > out;

    void run() {
        // vvvvv put your code here vvvvv

        // ^^^^^ put your code here ^^^^^
    }

    SC_CTOR( Multiplier ) {
        SC_METHOD( run );
        sensitive << in1 << in2;
    }

};
```

SystemC

- Edit your source code by editor (e.g., notepad++,…)
  - MAC.h

```
SC_MODULE( MAC ) {
    sc_in < sc_uint<4> > in1, in2;
    sc_in < sc_uint<8> > in3;
    sc_out < sc_uint<9> > out;

    Adder *ADD_1;
    Multiplier *MUL_1;

    // vvvvv put your code here vvvvv

    // ^^^^^ put your code here ^^^^^

    SC_CTOR( MAC )
    {
        // vvvvv put your code here vvvvv



        // ^^^^^ put your code here ^^^^^
    }
};
```

Build & Run

- cd < file path >
- %make

```
11:41 mlchip150@ee21[~/AI_Chip_Design-master/LAB/lab1/lab1_mac]$ make
g++ -I . -I  /RAID2/COURSE/mlchip/mlchipTA01/systemc-2.3.3/include -L . -L /RAID2/COURSE/mlchip/mlchipTA01/syst
emc-2.3.3/lib-linux64 -o run *.cpp -lsystemc-2.3.3 -Wl,-rpath,/RAID2/COURSE/mlchip/mlchipTA01/systemc-2.3.3/lib
-linux64
./run

        SystemC 2.3.3-Accellera --- Mar  2 2024 23:27:20
        Copyright (c) 1996-2018 by all Contributors,
        ALL RIGHTS RESERVED
A       B       C       Y
7       6       105     147
3       1       255     258
10      12      41      161
13      10      171     301
2       11      227     249
6       12      194     266
4       8       27      59
8       7       141     197

Info: /OSCI/SystemC: Simulation stopped by user.
```