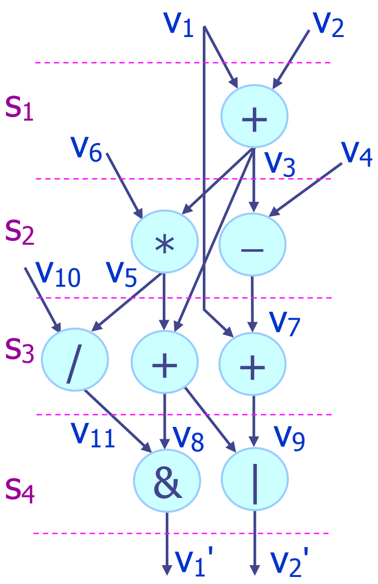
Lab 3: Allocation

Subtasks in allocation

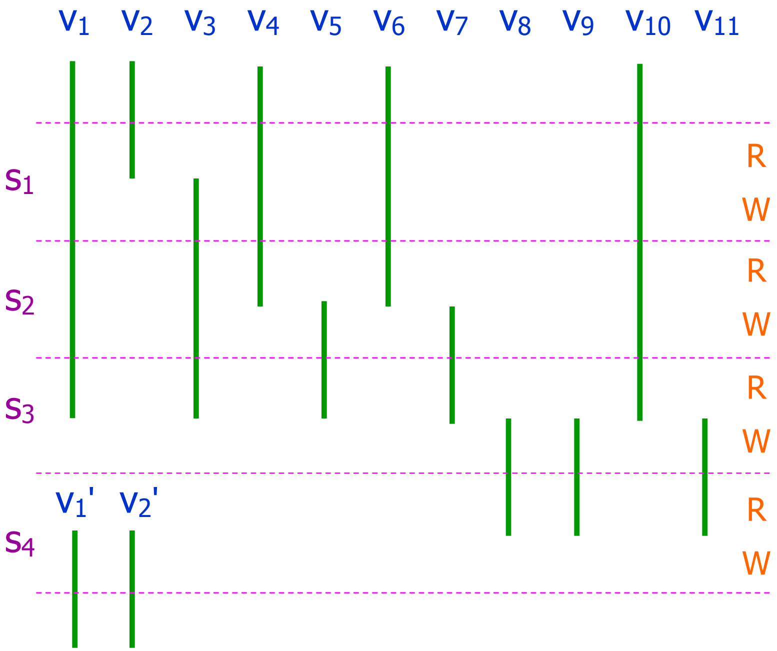
- **Unit selection**
  - selects the number and types of different functional and storage units form the RT component library
- **Operation-to-FU assignment (Functional-unit binding)**
  - map a computation to an FU of an appropriate type
- **Value-to-register assignment (Register binding)**
  - Values with nonoverlapping *lift times* can share the same location
- **Transfer-to-wire assignment (Interconnection binding)**
  - Mux-oriented architecture
    - Multiplexers: connect to the unit receiving the transfer
- **Wire to FU-port assignment**
    - Commutative operations

Left-Edge Algorithm (1/3)

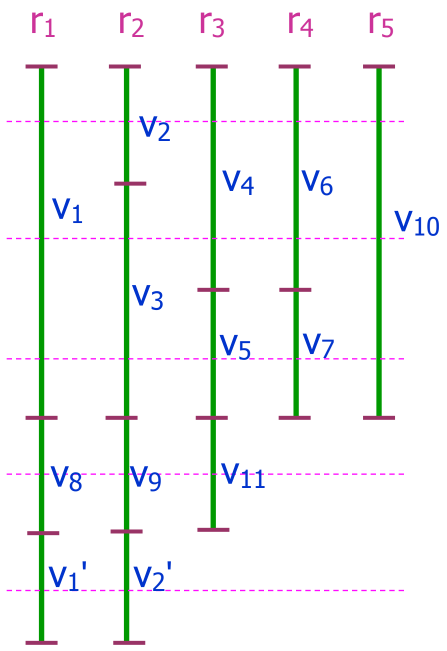
- **Left-Edge Algorithm for Register Binding**



DFG



Lifetime intervals

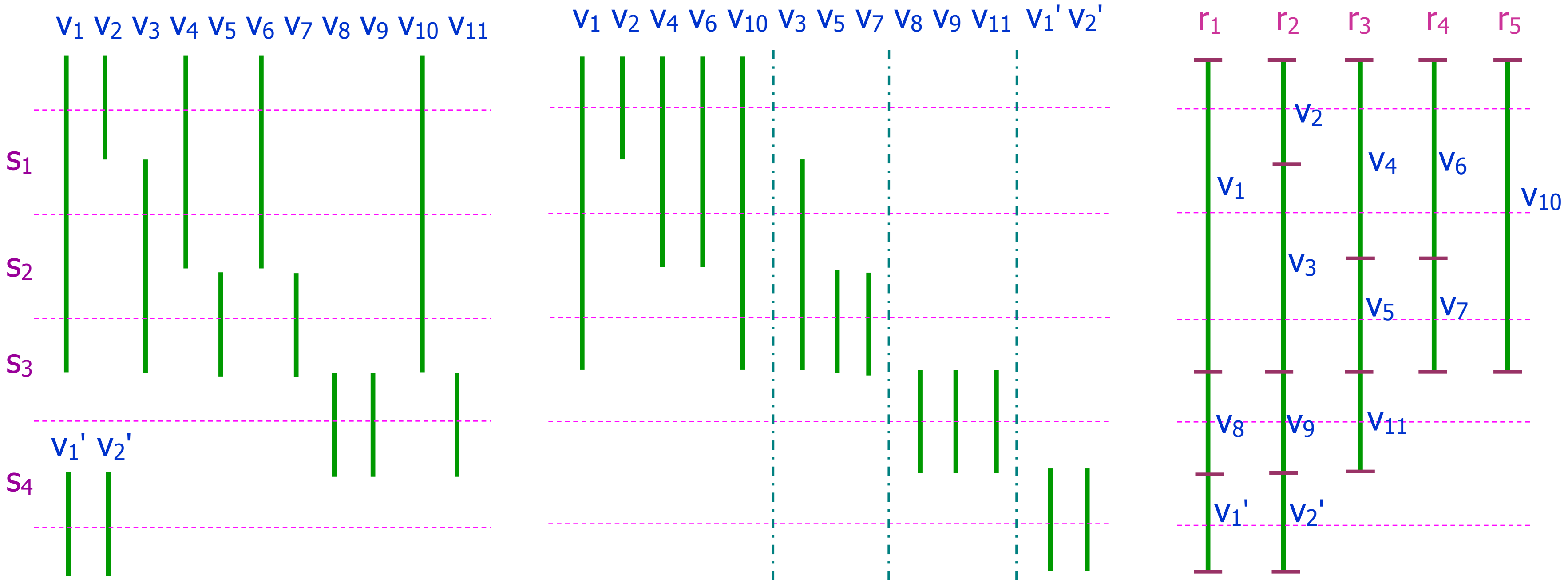


Registers

Left-Edge Algorithm (2/3)

```
for all $v \in L$ do MAP[$v$]=0;  endfor
SORT($L$);    /* sort the variables in L in acending order with their start times*/
reg_index = 0;
while $L \neq \emptyset$ do
        reg_index = reg_index + 1;
        curr_var = FIRST($L$);
        last = 0;
        while curr_var $\neq$ null do
                if Start(curr_var) $\geq$ last then
                        /* share the register */
                        MAP[curr_var] = reg_index;
                        last = End(curr_var);
                        temp_var = curr_var;
                        curr_var = NEXT($L$, curr_var);
                        DELETE($L$, temp_var);
                else
                        curr_var = NEXT($L$, curr_var);
                endif
        endwhile
endwhile
```

Left-Edge Algorithm (3/3)

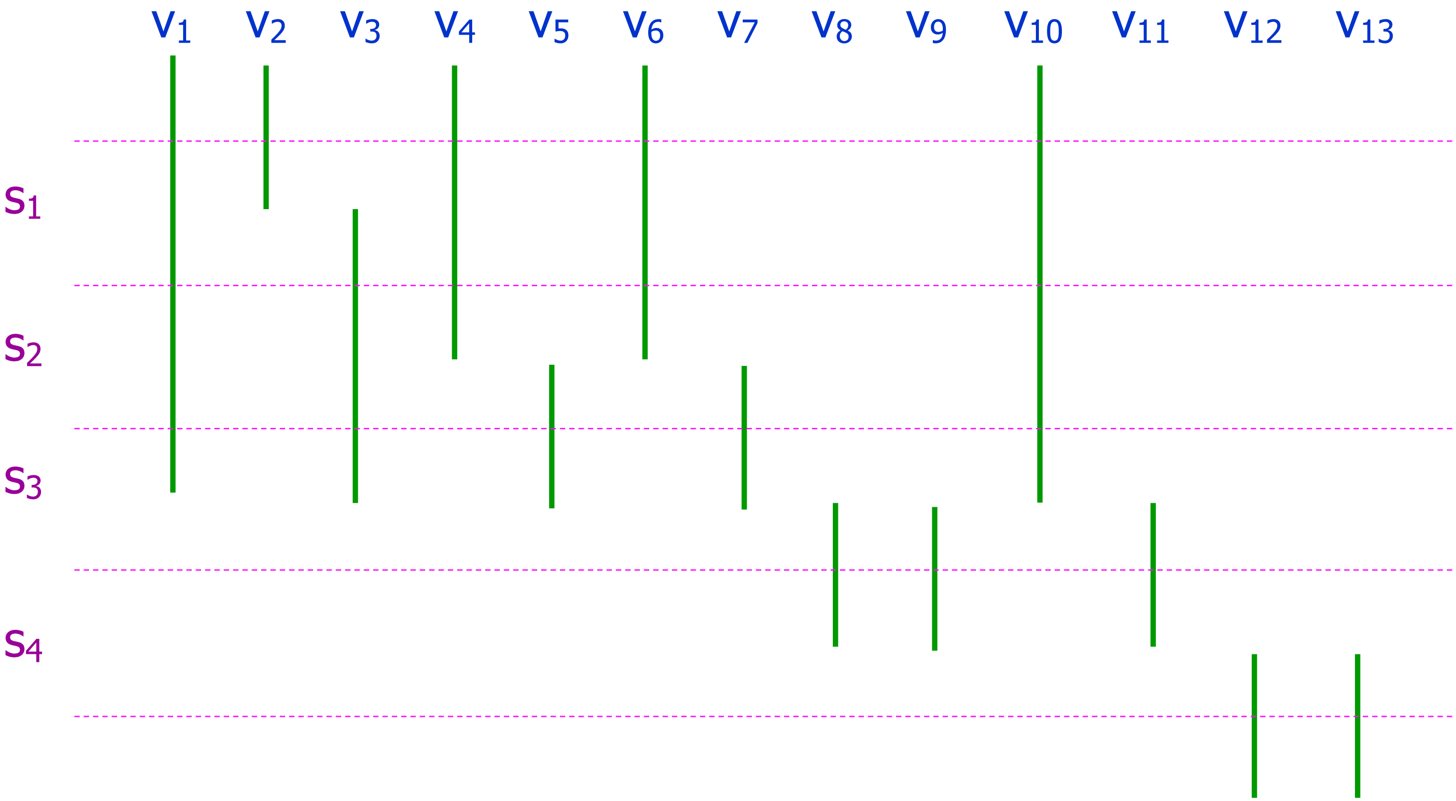


v_1 v_2 v_3 v_4 v_5 v_6 v_7 v_8 v_9 v_{10} v_{11}
s_1
s_2
s_3
s_4
v_1' v_2'
v_1 v_2 v_4 v_6 v_{10} v_3 v_5 v_7 v_8 v_9 v_{11} v_1' v_2'
r_1 r_2 r_3 r_4 r_5
v_2
v_1
v_4
v_6
v_{10}
v_3
v_5
v_7
v_8
v_9
v_{11}
v_1'
v_2'

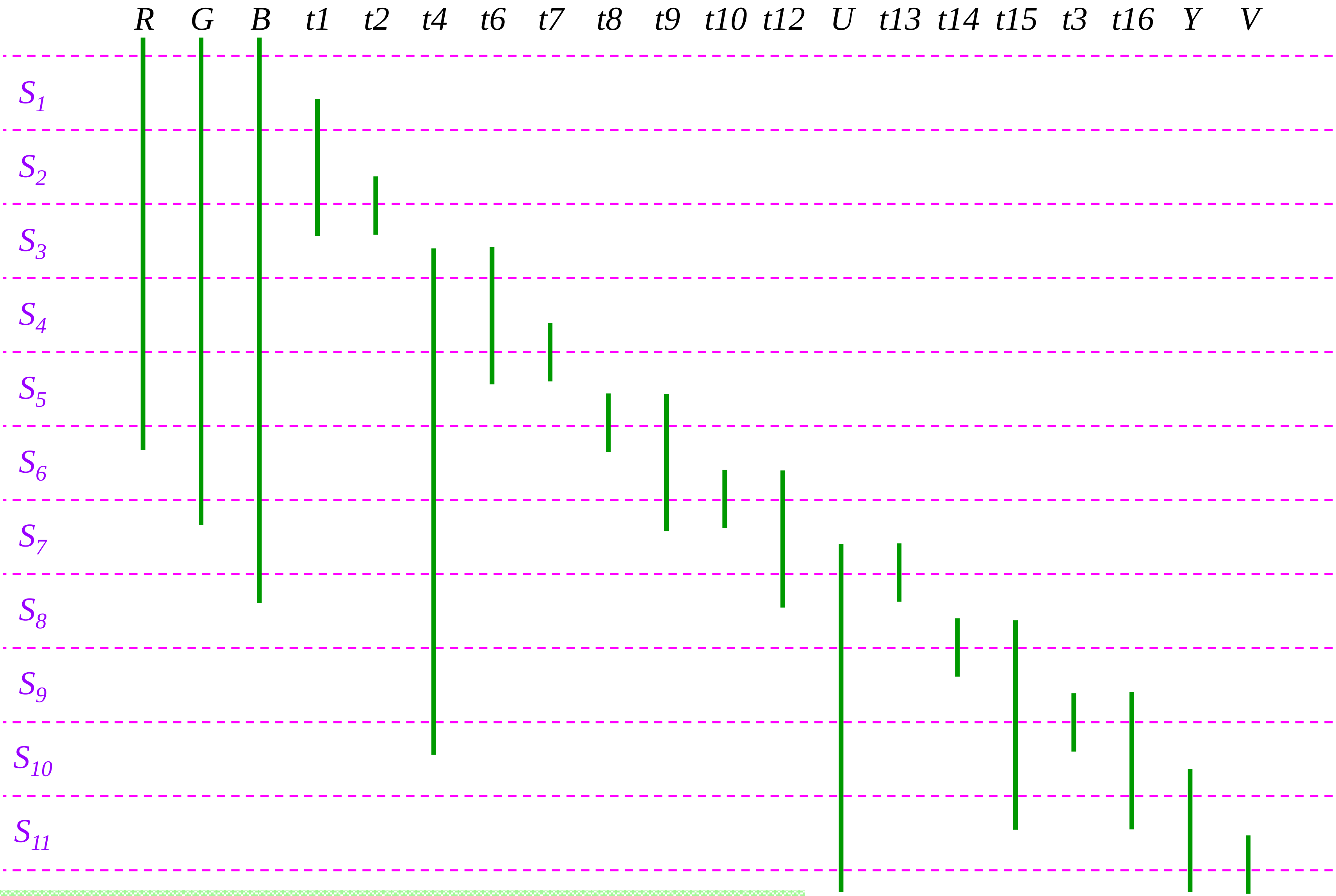
Lab 3: Allocation

- 下載並安裝Dev-C++
- 參閱Left-Edge Algorithm for Register Binding範例
- 撰寫Left-Edge Algorithm的C/C++程式
- 以Left-Edge Algorithm程式進行Lift_time1以及Lift_time2的Register Binding
- 繳交程式及實驗報告

Lift_time1



Lift_time2


R
G
B
t1
t2
t4
t6
t7
t8
t9
t10
t12
U
t13
t14
t15
t3
t16
Y
V
S_1
S_2
S_3
S_4
S_5
S_6
S_7
S_8
S_9
S_{10}
S_{11}

程式碼+實驗報告

- 實驗報告 及程式碼以壓縮檔繳交，每位同學均須繳交
- 實驗報告壓縮檔請以實驗編號及自己的學號姓名命名，例如：Lab3_M999999999陳小華.rar，於規定時間內上傳至“中山大學網路大學-作業評量區”繳交
- 實驗報告內容包含
  - 實驗主題、實驗日期、學號姓名
  - 實驗內容、過程及結果
    - 實驗內容
    - 實驗畫面、電路圖…
    - 實驗結果及分析
  - 實驗心得