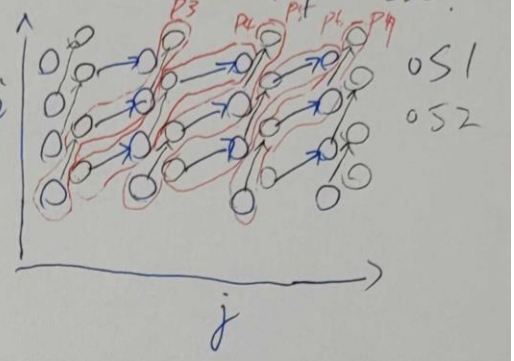
Advanced compiler design HW1 r12631055

(a) Yes, The partition iterations can separate to different processor.

After the transformation, there is no loop-carried dependences. All data dependences are independent to the outmost loop.



(b)
```
FOR i = 1 TO n DO
    FOR j = 1 TO n DO
        A[i,j] = A[i,j] + B[i-1,j]   (S1
        B[i,j] = A[i,j-1] * B[i,j]   (S2
```

Assume the affine partition is:

P = a*i + b*j + c (S1

P = d*i + e*j + f (S2

S1[i,j] δf S2[i,j+1]

a*i + b*j + c = P = d*i + e*(j+1) + f

That is (a-d)*i + (b-e)*j = f+e-c

or a=d, b=e, f+e=c

S2[i,j] δf S1[i+1,j]

a*(i+1) + b*j + c = d*i + e*j + f

That is (a-d)*i + (b-e)*j = f-c-a

or a=d, b=e, f-c=a

Let c=0, a=1, we could get a solution: (a,b,c,d,e,f) = (1,-1,0,1,-1,1,

∴ P = i - j (S1

P = i - j + 1 (S2

```
For P = 1-n TO n DO
    For i = 1 TO n DO
        For j = 1 TO n DO
            If P == i - j
                A[i,i-P] = A[i,i-P] + B[i-1,i-P]
            If P == i - j + 1
                B[i,i-P+1] = A[i,i-P] * B[i,i-P+1]
```

∴

```
For P = 1-n TO n DO
    For i = 1 TO n DO
        If 1 ≤ i-P ≤ n
            A[i,i-P] = A[i,i-P]
                     + B[i-1,i-P]
        If 1 ≤ i-P+1 ≤ n
            B[i,i-P+1] = A[i,i-P]
                       * B[i,i-P+1]
```

```
For P = 1-n TO n DO
    If P ≥ 1
        B[i, i-P+1] = A[i, i-P] * B[i, i-P+1]
    For i = MAX(1, P+1) TO MIN(n, P+n-1) DO
        A[i, i-P] = A[i, i-P] + B[i-1, i-P]
        B[i, i-P+1] = A[i, i-P+1] * B[i, i-P+1]
    If P ≤ 0
        A[i, i-P] = A[i, i-P] + B[i-1, i-P]
```