



The Abdus Salam
International Centre
for Theoretical Physics



IAEA
International Atomic Energy Agency

Foundation of Modern Computer Architectures for HPC

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TO DO

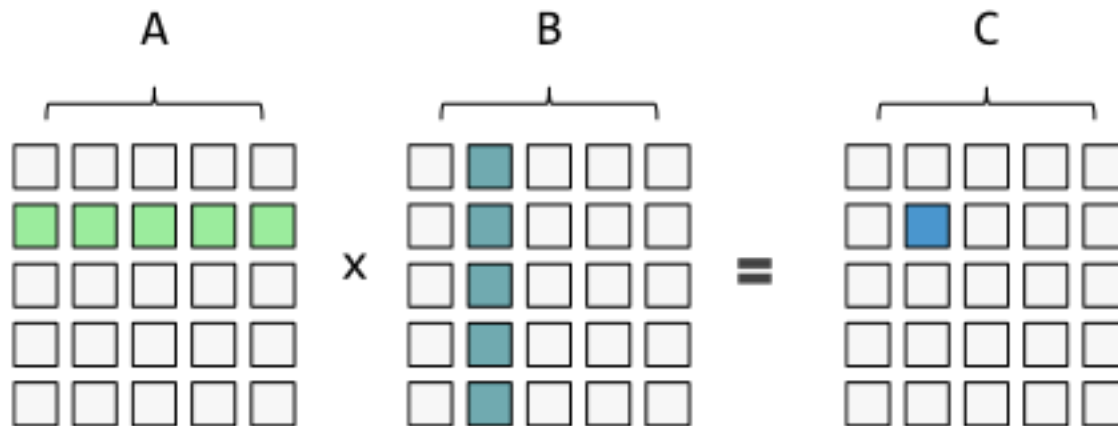
```
$cd /scratch/  
$mkdir $USER  
$cd $USER  
$scp hp83-inf-21:/scratch/ca_lab.tar.gz .
```



Exercises

1. Matrix Multiplication
2. Matrix Transpose

MATRIX MULTIPLICATION



$$C[i][j] = \text{sum}(A[i][k] * B[k][j]) \text{ for } k = 0 \dots n$$

In our case:

$C[1][1] \Rightarrow$

$$A[1][0] * B[0][1] + A[1][1] * B[1][1] + A[1][2] * B[2][1] + A[1][3] * B[3][1] + A[1][4] * B[4][1]$$

Transpose

1	2	3	4
5	6	7	8
9	10	11	12
13	14	15	16



1	5	9	13
2	6	10	14
3	7	11	15
4	8	12	16

Fast Transpose - Step 1

1	2	3	4
5	6	7	8
9	10	11	12
13	14	15	16

1	2
5	6

0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0

- Copy the data on the buffer block

Fast Transpose - Step 2

1	2	3	4
5	6	7	8
9	10	11	12
13	14	15	16

1	5
2	6

0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0

- Transpose the block

Fast Transpose - Step 3

1	2	3	4
5	6	7	8
9	10	11	12
13	14	15	16

1	5
2	6

1	5	0	0
2	6	0	0
0	0	0	0
0	0	0	0

- Copy the transposed block from the buffer block to the destination matrix

Fast Transpose - Step 4

1	2	3	4
5	6	7	8
9	10	11	12
13	14	15	16

3	4
7	8

1	5	0	0
2	6	0	0
0	0	0	0
0	0	0	0

- Iterates over blocks

Fast Transpose - Step 5

1	2	3	4
5	6	7	8
9	10	11	12
13	14	15	16

3	7
4	8

1	5	0	0
2	6	0	0
0	0	0	0
0	0	0	0

- Iterates over blocks

Fast Transpose - Step 6

1	2	3	4
5	6	7	8
9	10	11	12
13	14	15	16

3	7
4	8

1	5	0	0
2	6	0	0
3	7	0	0
4	8	0	0

- Iterates over blocks