Matrix Matrix Multiplication Parallel Implementation

(A Simple Parallel Algorithm)

e.g.

A=

2	3	4	5
9	8	7	6
5	4	2	3
8	7	3	4

B=

3	5	7	6
2	7	6	3
7	5	3	2
4	3	2	5

Divide A and B among 4 processes(P0, P1, P2, P3):

A=

	2	3	4	5
P0	9	8	7	6
	5	4	2	3
P2	8	7	3	4

P1

P3

B=

	3	5	7	6
P0	2	7	6	3
	7	5	3	2
P2	4	3	2	5

P1

P3

Total number of steps: sqrt(p)=sqrt(4)=2

<u>Step 1:</u>
Find A1 from A by following process:

A=

2	3	4	5
9	8	7	6
5	4	2	3
8	7	3	4

← Left Shift

A1=

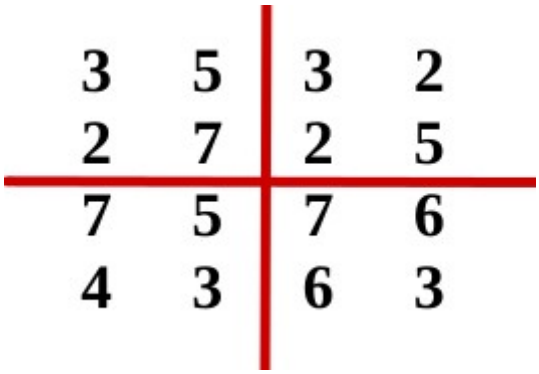
2	3	4	5
9	8	7	6
2	3	5	4
3	4	8	7

Find B1 from B by following process:
B=

3	5	7	6
2	7	6	3
7	5	3	2
4	3	2	5

↑
Up Shift

B1=



P0 Process:

2	**3**	*****	**3**	**5**	**=**	**12**	**31**
9	**8**		**2**	**7**		**43**	**101**

P1 Process:

4	**5**	*****	**3**	**2**	**=**	**22**	**33**
7	**6**		**2**	**5**		**33**	**44**

P2 Process:

2	**3**	*****	**7**	**5**	**=**	**26**	**19**
3	**4**		**4**	**3**		**37**	**27**

P3 Process:

5	**4**	*****	**7**	**6**	**=**	**59**	**42**
8	**7**		**6**	**3**		**98**	**69**

C1=

12	**31**	**22**	**33**
43	**101**	**33**	**44**
26	**19**	**59**	**42**
37	**27**	**98**	**69**

<u>Step 2:</u>
Find A2 from A1 by following process:

A1=

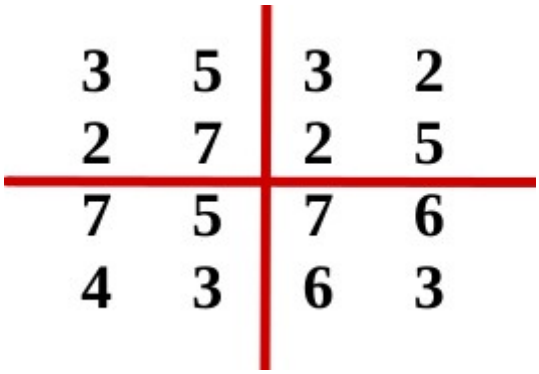
2	**3**	**4**	**5**	
9	**8**	**7**	**6**	**← Left Shift**
2	**3**	**5**	**4**	
3	**4**	**8**	**7**	**← Left Shift**

A2=

4	**5**	**2**	**3**
7	**6**	**9**	**8**
5	**4**	**2**	**3**
8	**7**	**3**	**4**

Find B2 from B1 by following process:

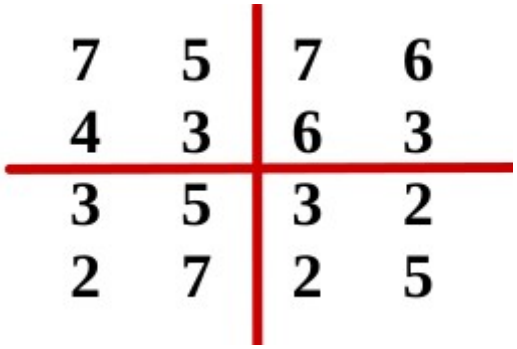
B1=



3	5	3	2
2	7	2	5
7	5	7	6
4	3	6	3

↑ Up Shift ↑ Up Shift

B2=



7	5	7	6
4	3	6	3
3	5	3	2
2	7	2	5

P0 Process:

4	5	*	7	5	=	48	35
7	6		4	3		73	53

P1 Process:

2	3	*	7	6	=	32	31
9	8		6	3		111	78

P2 Process:

5	**4**	*****	**3**	**5**	**=**	**23**	**53**
8	**7**		**2**	**7**		**38**	**89**

P3 Process:

2	**3**	*****	**3**	**2**	**=**	**12**	**19**
3	**4**		**2**	**5**		**17**	**26**

C2=

48	**35**	**32**	**21**
73	**53**	**111**	**78**
23	**53**	**12**	**19**
38	**89**	**17**	**26**

Final Result

C= C1 + C2

60	**66**	**54**	**54**	**=**	**12**	**31**	**22**	**33**	**+**	**48**	**35**	**32**	**21**
116	**154**	**144**	**122**		**43**	**101**	**33**	**44**		**73**	**53**	**111**	**78**
49	**72**	**71**	**61**		**26**	**19**	**59**	**42**		**23**	**53**	**12**	**19**
75	**116**	**115**	**95**		**37**	**27**	**98**	**69**		**38**	**89**	**17**	**26**