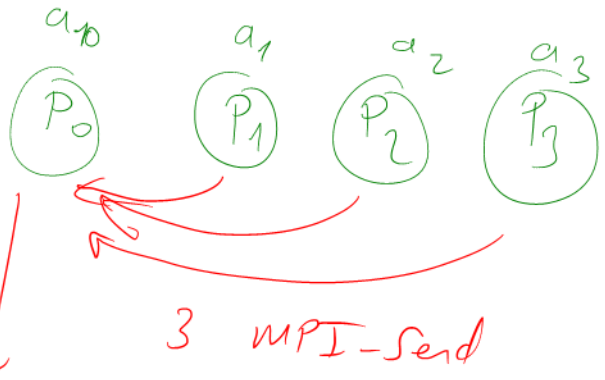
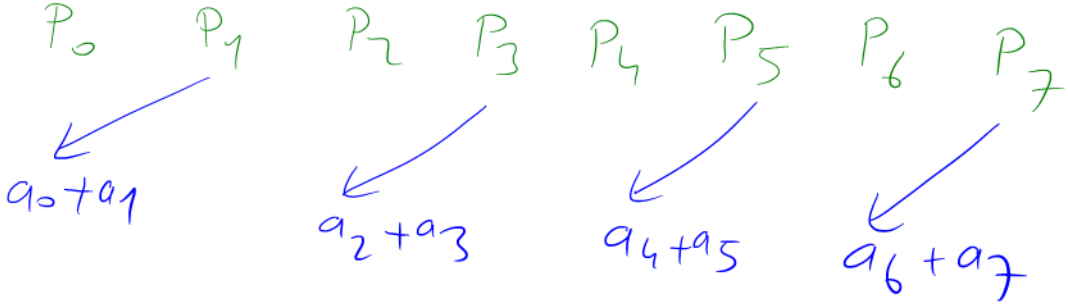
HW-II 2^n number of processes.

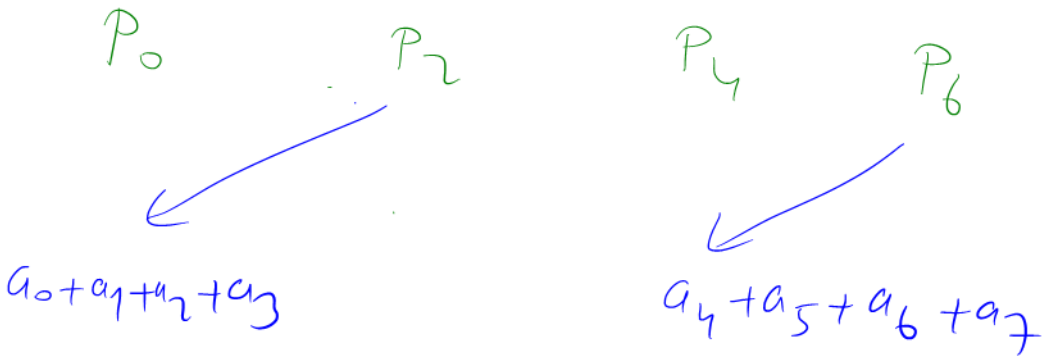


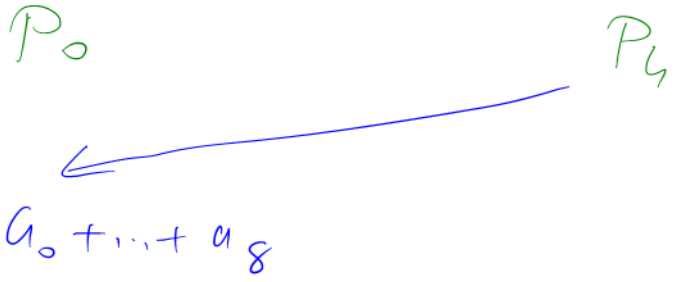
$a_0 += a_1;$
$a_0 += a_2;$
$a_0 += a_3;$
} 3 additions

$a_1 + a_2 + a_3 + a_4 = ?$

7 Sends, 7 Recvs, 7 adds.







Application - 1 :

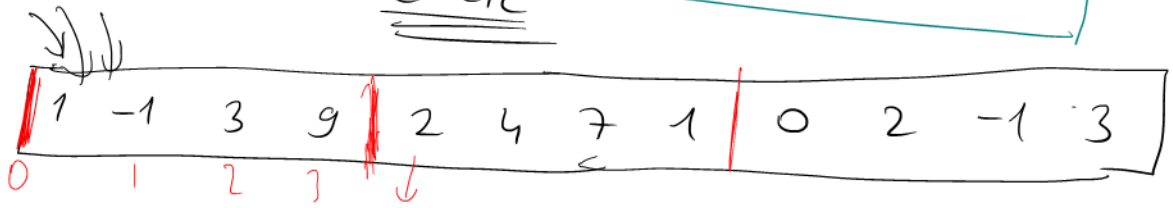
Matrix Vector Product :

Computation

C'de

$$\begin{bmatrix} 1 & -1 & 3 & 9 \\ 2 & 4 & 7 & 1 \\ 0 & 2 & -1 & 3 \end{bmatrix} \begin{bmatrix} 2 \\ -1 \\ 0 \\ 1 \end{bmatrix} = \begin{bmatrix} 12 \\ 1 \\ 1 \end{bmatrix}$$

A X b



= A

Inner Product

$$\langle x, y \rangle = x_1 y_1 + x_2 y_2 + \cdots + x_k y_k$$

$$\begin{bmatrix} \vec{a_1} \\ \vec{a_2} \\ \vec{a_3} \end{bmatrix} \vec{x} = \begin{bmatrix} \langle \vec{a_1}, \vec{x} \rangle \\ \langle \vec{a_2}, \vec{x} \rangle \\ \langle \vec{a_3}, \vec{x} \rangle \end{bmatrix}$$

b

(1) float innerProd (float *x, float *y, int n)

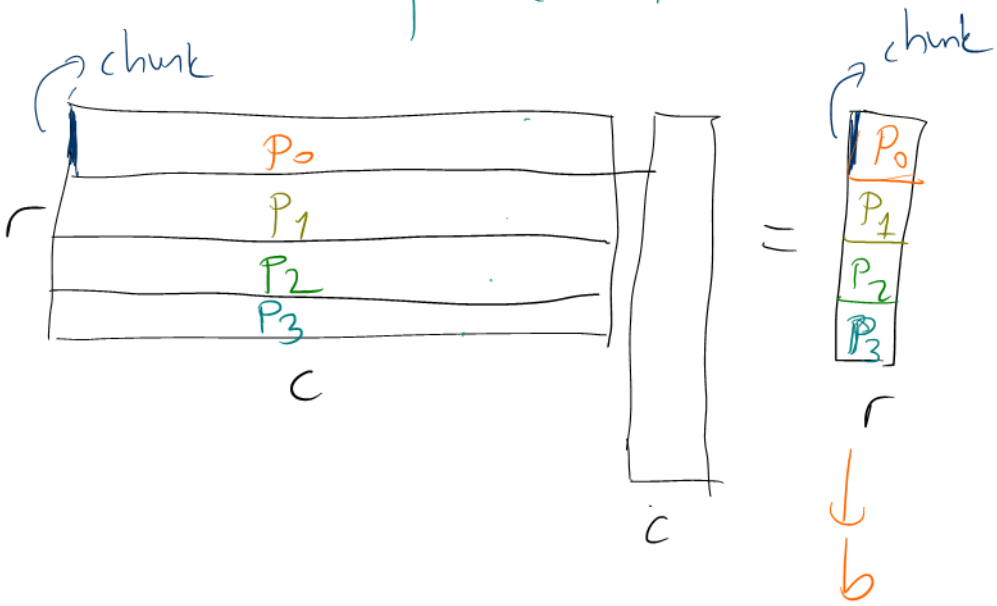
!!!

&A[0]
&A[4]
&A[8]

depends on column number.

Never changes

Data Decomposition!



100 satir $\xrightarrow{4 \text{ proc}}$ 25 satir

$\xrightarrow{5 \text{ proc}}$ 20 satir

chunk = r / size;

108 satir $\xrightarrow{5 \text{ proc}}$ 22
22
22
22
20

Communication Pattern:

- Assume that A and x are located at MASTER process.

1. MPI_Scatter(A, ...)
2. MPI_Bcast(A, ...)
3. Computation phase (innerProd) ~~$b = Ax$~~ ; $b_{local} = A_{local} \times x$
4. MPI_Gather(b_{local}, ...)

Parallel Matrs Vektor Carpimi yapan fonksiyon:

```
float * matVecProd( float *A, float *X, int r, int c, int size )
```

r → row, c → column, size → # of procs.

- PLmAlgPack.h
- PLmAlgPack.c
- test.c
- MakeFile

→ 21 days

HW-III

Due: April, 18th 23:00

```
void myReduce(int a, int np, int root)
{
    int layer = log2(np);
    for (i = 0; i < layer; i++) {
    }
```

mod(rank, 2^{i+1}) == 2^{i} → 0

mod(rank, 4) == 2 → 0

mod(rank, 8) == 4 → 0

0 → 4
1 → 2
2 → 1